

MARINE BOARD OF NEW SOUTH WALES.

R U L E S

TO BE OBSERVED BY

SHIPOWNERS, SURVEYORS, AND
INSPECTORS.

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MARINE BOARD OF NEW SOUTH WALES.

RULES

TO BE OBSERVED BY

SHIPOWNERS, SURVEYORS, AND INSPECTORS

WHEN

SURVEYING STEAMERS, FOR PASSENGER CERTIFICATES, AND
FOR OTHER PURPOSES IN CONNECTION WITH THE
NAVIGATION ACTS OF 1871-81.

GEO. S. LINDEMAN, R.N., SECRETARY.



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SYDNEY : WILLIAM APPLGATE GULLICK, GOVERNMENT PRINTER.

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MARINE BOARD RULES.

Preliminary.

THESE instructions relate to the duties to be performed by Surveyors and Inspectors acting under the Navigation Acts in force in this Colony. The said Surveyors and Inspectors will remember that it is not intended by these instructions to supersede a careful study on their part of the Acts referred to, nor to relieve them from the obligation of making themselves intimately acquainted with their provisions. It is also important that these officers should bear in mind that in all cases in which the Marine Board rely upon their judgment, they are responsible to the said Board for what they do. In doubtful cases they should give full particulars, and apply to the Board for instructions, sending up sketches where necessary.

Object of instructions.

2. Surveyors are to perform all their duties under the direction of the Marine Board, and they will be distinctly and personally held responsible if they convey to any person or department, under any circumstances whatsoever (excepting only when directed to do so by the Secretary or other responsible officer), any information that may come into their possession in the performance of their official work.

Surveyors' duties are confidential.

3. Under the powers conferred on them by the Navigation Acts, the Marine Board Surveyors or Inspectors may at all reasonable times go on board any ship or vessel whatsoever for the purpose of examining the hull and machinery, and making any report thereon to the said Board.

Powers of Surveyors and Inspectors.

They may inspect any boats, equipments, or materials on board or belonging to any such ship or vessel to which the provisions of the said Acts extend.

They may go on board any such ship or vessel and inspect the same for the purpose of inquiring into or reporting upon the nature and causes of any accident or damage which such ship or vessel has sustained or caused, or is alleged to have sustained or caused.

Any person who shall wilfully impede any of the Marine Board Surveyors or Inspectors in the execution of their duty, and all persons aiding or abetting therein, may be apprehended and detained by any Inspector or Surveyor, or by any person called to his assistance, until such offender can be conveniently taken before a justice; and such offender, and any person who refuses to attend as a witness when so required before any person authorised in that behalf, or who refuses or neglects to make any answer, or to furnish any return, or to produce any document in his possession or power, or to take any oath or subscribe any declaration as aforesaid, shall, for each offence, incur a penalty not exceeding twenty pounds.

Applications of
Part II Navigation
Act.

4. The provisions contained in Part II of the "Navigation Act of 1871," and all Regulations made thereunder by the Marine Board, shall apply to all steamships, whether the same be British ships owned wholly or in part by subjects of Her Majesty, or foreign ships which shall be engaged in the trade of conveying passengers from any port or place within the jurisdiction to any port or place in any other part of Her Majesty's dominions, and to all harbour and river steamers.

Steamships to be
surveyed, and
owners to
transmit
declarations.

5. The owner of any steamship constructed or intended to carry passengers shall, during the actual employment of such ship in that capacity, cause such steamship to be surveyed twice at least in every year, at such convenient times as the Marine Board may direct, by a Shipwright-surveyor and by an Engineer-surveyor, and shall obtain a declaration of the sufficiency and good condition of the hull of such steamship, and of the boats and other equipments thereof hereby required, where such hull is constructed either wholly or partly of wood, and also, if the said Board so require, a statement of the number of passengers which such ship is constructed to carry, under the hand of such Shipwright-surveyor; and a declaration of the sufficiency and good condition of the hull, where such hull is constructed of iron, and of the machinery of such steamship, under the hand of such Engineer-surveyor; and in such declaration it shall be distinguished whether such steamship is, in construction and equipment, adapted for sea service or limited coasting, as well as for harbour, river, or lake service, or for harbour, river, or lake service only; and when any such steamship is adapted for harbour, lake, and river service only, or for a limited coasting voyage, such declaration shall state the local limits within which such steamship is, in the judgment of such Surveyor, adapted for plying; and such owner shall

transmit such declarations to the said Board within fourteen days after the date thereof respectively. Provided that it shall be lawful for the said Board to accept and recognise all certificates, being unexpired and in legal operation, issued under the provisions of any Act or statute now or herein-after in force in the United Kingdom or in any British possession, to any steamship trading to or from any port or place within the jurisdiction; and the acceptance of the certificate of any such steamship shall be as valid and effectual for all purposes as if such certificate had been issued in this Colony. And provided always that it shall be competent for the said Board, in their discretion, to disallow and reject any such certificate whenever, in their opinion, the acceptance thereof would be attended with risk or uncertainty; and any certificate so disallowed or rejected shall, for and within the said jurisdiction, be and be deemed to be a cancelled certificate.

6. The Act requires that one of the duplicates of the certificates shall be put up in a conspicuous place, where it will be accessible to all persons on board, under a penalty not exceeding ten pounds, and the Surveyors are to inform the Marine Board of any case of non-compliance with this enactment which may come to their knowledge.

Act to be put up in a conspicuous place.

7. Surveyors should insert in their declaration the particulars of the ship's registry. These they should take from the certificate of registry at every survey; and whenever these particulars differ from those stated in the last declaration granted for the ship, the reason of the difference should be ascertained, and stated in the column for remarks in their declaration, as well as the date on which they examine the certificate of registry.

Particulars of ship's registry.

No certificate should be issued until the vessel's tonnage is registered at the Custom House.

8. In order to prevent inconvenience and delay to the owners, Surveyors and Inspectors are to be careful to be on the spot at the time prescribed, so far as is consistent with the due performance of their duties. Should they be unable to attend as required, notice should be given to that effect.

Surveyors and Inspectors to be in attendance.

9. Surveyors and Inspectors should make their inspections when the agent, master, or chief mate, and engineer of the vessel is present, if possible. Repairs can then be effected and defects pointed out to the proper persons without incurring the uncertainty and delay attendant upon messages delivered to subordinate officers. If the owner does not regard the survey as being of sufficient importance to instruct

Agent, master, or mate to be present.

a responsible representative to be present, the Surveyors and Inspectors will, of course, make the survey without him.

If a vessel usually plying in one district is taken to another district to be surveyed, the Surveyor in the latter district is not to give a declaration without first communicating with the Surveyor for the former district ; nor, if there is any difference of opinion, without referring the question to the Marine Board for decision.

Alterations
subsequent to
survey to be
noted and re-
ported.

10. Surveyors and Inspectors are to take frequent opportunities of visiting all steamships as they arrive from other ports, and should they find on inspection that any provision of the Acts is not complied with, or that any of the equipments have been damaged or taken away since the last survey, the fact should be pointed out to the master or officer in charge of the vessel, and a report forwarded to the Marine Board at the same time. This is a very important part of these officers' duties.

It is a part of the Surveyors' duty to report all cases of infringement of the Act that come to their notice, and in reporting them they should take care to state what the evidence is on which their report is founded.

Whenever it comes to the knowledge of a Surveyor that any doubts have been raised by another Surveyor as to the efficiency of the hull, machinery, boilers, or equipments of a steamship under survey, a declaration should not be granted until such defects or alterations have been made good, unless the Surveyor who had any doubt upon the matter is satisfied that there is no necessity for repairs or alterations, as well as the Surveyor who is making the survey. In these cases, therefore, the Surveyor who is surveying the vessel should communicate with the Surveyor who is of opinion that repairs or alterations were needed, and if they do not quite agree on the point raised, the matter should be at once submitted to the Marine Board. Previous correspondence should be asked for before granting a declaration in the case of a vessel, when, on a previous occasion, a declaration has been refused, or an incomplete declaration has been granted, or where the previous declaration has been granted conditionally on alterations or additions being made previous to a further survey.

Declaration
not to be given
without great
caution.

11. Surveyors are in no case to give a declaration, either for the hull, machinery, boilers, or equipments of a steamer, unless they are satisfied that all the requirements of the Acts have been complied with. The Marine Board will hold any Surveyor responsible to the fullest extent for the per-

formance of the duty entrusted to him, and will support him in any reasonable steps he may think necessary in order to the full performance of his duty.

12. In any case in which the Surveyor has reason to believe that the hull, machinery, boilers, or equipments are not fit for so long a time as the owner has applied for, he is to grant his declaration for such shorter period as he may deem expedient, informing the owners, if necessary, of his reasons for so doing. But, unless it is the docking time only that limits his declaration, or the latest date for which a certificate can be granted in accordance with the Regulations, he is not to grant a declaration for a steamer for a shorter period than one month, without the written authority of the Marine Board. In such cases, and also in cases in which the Surveyor refuses a declaration altogether, he is to give a statement in writing of the repairs he considers necessary to enable him to grant a declaration for the time asked. By this paragraph, the Surveyor is to understand that a foreign-going steamship that is not fit for a declaration for three months is not to be deemed by him as fit to hold a certificate at all. In any special case the Surveyor is of course to ask directions from the Board. In all cases vessels must be swung for the adjustment of their compasses before obtaining a certificate of over one month's duration.

Short declaration, when to be granted.

13. Every person who knowingly and wilfully makes, or assists in making, or procures to be made, a false or fraudulent declaration or certificate, with respect to any vessel requiring such declaration or certificate under the Navigation Acts, or who forges, assists in forging, or procures to be forged, fraudulently alters, assists in fraudulently altering, or procures to be fraudulently altered, any declaration or certificate required by the said Acts, or any words or figures in any such declaration or certificate, or any signature thereto, is guilty of misdemeanour.

Penalty for fraud in the matter of declaration.

Three descriptions of passengers' certificates will be issued by the Marine Board, viz. :—

Sea-going, Limited Coasting, and Harbour or River Certificates.

Surveyors' Declarations.

14. The particulars required to be given in the declaration for these certificates are the following, which are treated of under separate heads :—

Surveyors' declarations.

- (1.) That the hull of the ship is sufficient for the service intended and in good condition.

- (2.) That the boats, life buoys, lights, signals, compasses, shelter, and accommodation for passengers, and the certificates of the master, and mate or mates, engineer or engineers, are such and in such condition as required by the Acts.
- (3.) The time (if less than six months) for which the said hull and equipments will be sufficient.
- (4.) The limits (if any) between which, as regards the hull and equipments, the ship is, in the Surveyor's judgment, fit to ply.
- (5.) The number of passengers which the ship is, in the Surveyor's judgment, fit to carry, distinguishing if necessary between the respective numbers to be carried on deck, and in the cabins and in different parts of the deck and cabin, such numbers to be subject to such conditions and variations as the nature of the voyage, the cargo carried, and other circumstances may require.

*Passenger Accommodation.**

Passenger
spaces.

Foreign-going
vessel.

15. In allotting the number of passengers for these respective certificates, 72 cubic feet (that is 2 feet wide, by 6 feet long, and 6 feet high), is to be allowed each passenger in a seagoing ship. (See Appendix A.)

In a harbour or river certificate, 4 superficial feet is to be allowed each passenger.

Limited coasting
vessel.

For a limited coasting vessel, the amount of cabin or other sheltered accommodation wherein passengers can be comfortably seated, and the equipment of the vessel in the matter of boats, anchors, masts, sails, water-closets, life belts, rockets, deck pump, &c., will have to be fitted and considered in allotting the number of passengers she shall be allowed to carry. A limited coasting certificate will also be restricted to the places mentioned therein, when possible, which are not to be greater than a distance of 20 miles apart. (See Appendix A, Table E 3.)

In the measurement of vessels for their passenger-carrying capacity, the length of the deck is taken from abaft the windlass to forward of the wheel aft, if there is one; if there is not a wheel aft, to where passengers can stand properly and clear of the tiller.

The breadths are taken from inside the gutter waterway, or the inside edge of the raised covering board or inside edge

* Detailed instructions as to the proper mode of ascertaining the maximum numbers of passengers to be carried under the different classes of passenger certificates will be found in the Appendix. (See Appendix A.)

of the rail, if the bulwarks tumble home further than the inside edge of the water-way or covering-board. Clear area means the space after all incumbrances, such as hatchways, skylights, companions, steam-chest casings, funnel casings, wheel, windlass, binnacles, masts, dunnage for luggage, boats carried inboard, and fittings for cattle, &c., are deducted. A raised quarter-deck, if the bulwarks are close, and of sufficient height and strength, may be measured; but a poop-deck, bridge, or spar-deck should not be measured, nor should any deck when the bulwarks are open, or are not of sufficient height and strength. The whole clear space on the deck may be appropriated to the fore-cabin passengers, or it may be divided into any proportion between the fore-cabin and the after-cabin passengers, as may be determined on at the time of the survey.

Where cargo, cattle, &c., are carried in the space measured for passengers, the following deductions are to be made:—

For every square yard of space measured for passengers occupied by cattle or other animals, or by cargo or other articles ...	}	one passenger.
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16. The number of passengers to be carried in the after-cabins or saloons is determined by the number of the berths or sofas properly constructed for sleeping berths, to which add the number due to the space on deck appropriated to the saloon passengers, and the sum will be the *total* number of after-cabin passengers allowed to be carried. The floor space of saloons, cabins, state-rooms, and passages must not be measured, unless in saloons and cabins in which berths are not fitted, then the clear available space is to be measured, and one passenger allowed for every 9 square feet. When sofas or seats are fitted, the measurements are to be taken from the back of the said sofas or seats. All passenger accommodation should be properly lighted and ventilated, and proper means of ingress or egress provided. The number of fore-cabin passengers is obtained in the same way as the after-cabin number. All floors of passenger accommodation must be caulked and properly secured. The lower hold must not be considered as proper accommodation for passengers, neither are spaces which consist of temporary accommodation upon the cargo, nor space lighted and ventilated by hatches. If the whole number of passengers obtained by the foregoing method exceeds the number representing the gross tonnage of the vessel, then the number of passengers must be reduced until the number does not exceed the number denoting the

Number of passengers below deck, how ascertained.

gross tonnage of the vessel. The number to be deducted may either be taken from the number of fore-cabin passengers or from the after-cabin passengers, or from both, in any proportion, as may be determined on at the time of the survey.

Passengers' deck-houses.

17. When there are deck-houses, and only narrow spaces between the sides of the deck-house and the bulwarks, such narrow spaces are not measured for passengers. When there is a deck-house amidships for the accommodation of after or first-class passengers, and the fore-cabin or second-class accommodation as either below, aft, or in a deck-house aft, then the whole of the clear space on deck should be appropriated for the use of second-class passengers.

All harbour passenger steamers must carry a stage plank at least 2 feet wide, fitted with battens and hand rails.

Number of passengers for excursion steamers, how to be determined.

18. For steamers used in excursions, the rules for measuring and calculating the numbers are the same as in other sea-going coast-trade steamers, except that, if application is made for an excursion certificate for short distances along the coast, the number originally calculated at 9 superficial feet to each passenger, should it exceed the gross tonnage of the vessel, need not be diminished so as to bring it down to that number. These vessels are to have all the equipments and requirements of sea-going steamers, except deck shelter; they must be decked, and in all respects are to be of such a substantial character as to be capable of standing bad weather in the event of being caught in it.

Where cargo, cattle, &c., are carried in the space measured for passengers in excursion steamers, the following deductions are to be made:—

For every square yard of space measured for passengers occupied by cattle or other animals, or by cargo or other articles	} one passenger.

In the case of what are known as saloon steamers (excursion or river) the decks on the top of the saloons, when properly and efficiently constructed, may be measured for passengers, provided that in the opinion of the surveyor the ship is stable enough.

The number of superficial feet as ascertained should be divided by nine in order to ascertain the number of passengers to be carried; but these measurements must not include any deck extending beyond the width of the saloon itself.

Number of passengers for river steamers, partially smooth water, how to be determined.

19. The measurements are to be made in the same manner as in sea-going steamers, except that after-saloons only are to be included.

There will be no distinction between fore-cabin and after-cabin passengers.

River steamers are divided into those which ply on waters parts of which only are smooth, and those which ply exclusively on smooth water.

Taking this division—

For steamers which ply in partially smooth water, divide the number of superficial feet on deck, obtained as above, by six, and the clear space in the after-saloon under upper deck by nine, and the sum of these quotients will be the number of passengers to be allowed.

It will usually be found that the space in front of the windlass is (more especially in sharp boats) nearly wholly taken up by the anchors and gear connected by them, and is not suitable for passenger accommodation except in dead smooth water. Seats on skylights or companion openings must not be allowed for passengers, as the full area of the opening in the deck must be deducted.

The following deductions are to be made in the last mentioned class of steamers for cattle or cargo carried in the space measured for passengers, viz. :—

For every square yard of space measured	}	one and a half passengers.
for passengers occupied by cattle or		
other animals, or by cargo or other		
articles 		

20. For smooth-water steamers divide the number of superficial feet on deck, obtained as above, by four, and the clear space in the after-saloon by nine, and the sum of these quotients is the number of passengers to be allowed.

Harbour and river steamers plying in smooth water only, passengers, equipment, &c.

The following deductions are to be made in the last-mentioned class of steamers for cattle or cargo carried in the space measured for passengers, viz. :—

For every square yard of space measured	}	three passengers.
for passengers occupied by cattle or		
other animals, or by cargo or other		
articles 		

21. In addition to and exclusive of a sufficient number of closets for cabin and saloon passengers, closets are to be provided for the *exclusive use of fore-cabin and deck passengers* in the ratio of three for every two hundred such passengers allowed by the passenger certificate, and a fair proportion must be allotted to the sole use of women and children, and so marked outside. Clear passages to these closets must always be maintained. In no case is a less

Water-closets.

number than two to be provided. These closets should be clean, well lighted, and well drained, and must be of sufficient height and size, and effectually protected from weather and sea. In carrying this Regulation into effect, there need never be more than six water-closets set apart for the exclusive use of the fore-cabin and deck passengers, whatever be the number of those passengers, provided there is also one suitable and accessible urinal for the use of fore-cabin and deck male passengers.

The cubic contents of water-closets and urinals erected *on deck* for the exclusive use of passengers on board home-trade steamers under this Regulation are not to be included in the ship's tonnage, provided each is permanently and conspicuously marked outside as "Water-closet," or "Urinal," "for Fore-cabin and Deck Passengers only."

Passengers in vessels of peculiar construction.

22. If from any peculiar construction of any vessel, there should be an unusual amount of permanent deck incumbrance, or an unusual amount of accommodation, so as greatly to reduce or increase the passenger accommodation, the case should be specially reported.

Alteration in passenger spaces.

23. When the passenger accommodation is increased whilst a certificate is in force, and the owners wish the number of passengers such increased space will accommodate inserted in their certificate before the next survey, the vessel should be remeasured, and a fresh declaration issued. Also, if the passenger accommodation is known to have been decreased whilst a certificate is in force, the fact should be reported to the Marine Board, and a fresh declaration issued.

Master and Crew Space.

Surveying space occupied by seamen.

24. The duty of surveying places occupied by seamen or apprentices on board ship is to be performed by the Shipwright Surveyor. The practical instructions appended have been prepared for the guidance of Surveyors in measuring the places appropriated to seamen on board merchant ships under section 9 of the Merchant Shipping Act, 1867. (See Appendix B and C.)

Surveyors are not required nor expected to enter into any crew space for the purpose of inspecting it unless it is in a sufficiently clean and clear state.

Meaning of expressions "ship" and "seaman."

25. It is well here to explain that the expression "ship" as used in the Principal Act includes "every description of vessel used in navigation not propelled by oars," and that the word "seaman" includes "every person (except masters,

pilots, and apprentices duly indentured and registered) employed or engaged to serve in any capacity on board any merchant ship." Section 2,
Merchant Ship-
ping Act, 1854.

Merchant Ship.

26. The Act of 1867 (section 9) provides that every place in any ship occupied by seamen or apprentices and appropriated to their use "shall contain a certain cubical space (72 cubic feet) and a certain superficial surface (12 feet) for each seaman." *This place must be such as to make the space required by the Act available for the proper accommodation of the men who are to occupy it, and must be securely constructed, properly lighted and ventilated, properly protected from weather and sea, and as far as possible shut off and protected from effluvia which may be caused by bilge water and cargo.* Cubic content,
height, and
floor area of
crew spaces]

27. Under the "Merchant Shipping Act, 1854," the tonnage of crew-spaces situated above the upper deck was, to the extent of one twentieth of the remaining tonnage, excluded from the gross tonnage of the ship. The "Merchant Shipping Act, 1867," however, makes no restrictions on either of these points. The tonnage of all the places for the berthing of seamen and apprentices, and appropriated to their use, whether situated above or below the upper deck, and whether under or above one twentieth of the tonnage, may now be deducted from the register tonnage of the ship, provided that the Surveyor certifies that the provisions of the Act in regard to such places are complied with. To be deducted
from tonnage
in certain cases.

28. Section 3 of the Merchant Shipping (Tonnage) Act, 1889, authorises, among other matters, a deduction from tonnage of "any space used exclusively for the accommodation of the master," subject to the following provisions:— Master's space.

"(a) The space deducted must be certified by a Surveyor appointed by the Marine Board as reasonable in extent, and properly and efficiently constructed for the purpose for which it is intended.

"(b) There must be permanently marked in or over the space the purpose to which it is to be applied, and that whilst so applied it is to be deducted from the tonnage of the ship."

Surveyors will require to see that the space for which deduction is claimed is exclusively for the masters' use, reasonable in extent, and properly and efficiently constructed. It should, therefore, comply with the provisions of the "Merchant Shipping Act, 1867," as regards light, ventilation, &c., and there should be permanently cut in a beam

within the space, and cut in or painted over the doorway or entrance, the words "Certified for the accommodation of the master."

Surveyors will observe that it is only where a deduction is claimed for master's space that they are required to inspect it as here mentioned.

Crew-space
whether de-
ducted from
tonnage or not,
to be kept free
from stores and
cargo.

29. Every place in any ship appropriated to the use of seamen or apprentices, and whether deducted from the register tonnage or not, must be kept free from stores and goods of any kind, not being the personal property of the crew, and if such place is not kept free from goods and stores, and two seamen have power to complain to the master, and if the goods and stores are not removed, then the master is deemed to be in fault, and each seaman is entitled to a shilling a day during the time which such goods or stores remain there.

Penalty.

Complaints as to
using crew spaces
improperly.

30. Upon the complaint of any person concerning the place appropriated to the accommodation and berthing of the crew of any ship, one of the Surveyors is required to inspect the place, and to make his report to the Marine Board. It will then be for the Board to take such steps as are required.

Upon a written complaint being made to the Surveyor that the provisions of the Act are not complied with as regards the crew-space accommodation on board any vessel which has been inspected and certified, the Surveyor will, as soon as possible, proceed on board the vessel, and if he finds that the provisions of the Act are not complied with, he will report the same to the Marine Board, and thereupon the deduction in respect of the crew-space shall be disallowed.

Iron decks.

31. Deductions for crew-space are not to be allowed in the case of vessels having an iron deck over this space, unless a wooden deck is laid on top of it, or unless the under side of the deck over the sleeping berths in the fore-castle, or crew-space, is sheathed or ceiled with wood.

In the case of vessels in which deductions for crew-space have already been allowed, the crew-space must be inspected by the surveyors as opportunity arises, and the deduction disallowed if this instruction be not complied with.

Amount of space
set apart to be
settled by owner.

32. It is to be distinctly understood and explained that the "Merchant Shipping Act of 1867" is not an enactment intended to regulate or interfere with the manning of merchant ships. It is not for the Surveyor to say how many men ought to be accommodated on board any particular ship or

any particular classes of ships. That is a matter to be arranged entirely between the owner as an employer, and the crew as the persons he employs to navigate and work his ship.

33. This point cannot be too clearly understood. On the one hand it is incumbent on the shipowner to man his ship properly, and on the other it is left to any seaman to refuse to engage to serve on board a ship if he thinks that the number of hands proposed to be engaged by the owner or master to form the crew is not sufficient for the ship or service. The proper complement to form a crew, and therefore the proper amount of accommodation to be provided for the crew are matters that must rest between, and be settled by, the owner and his servants; and with these points the Legislature has not interfered and the Surveyors have nothing to do.

Owner alone to see how many seamen the ship is to carry.

34. It is not in the power of the owner to say to the seamen, "The licensed accommodation for seamen on board this ship is for so many seamen only, and that number is the number settled by the Government as the proper number to form the crew of this ship." The Government has nothing whatever to do with it, as has been already explained.

Tonnage of space deducted not to settle number of hands to be carried.

The Surveyors must be careful that they do not authorise a deduction from tonnage for any place that does not come within the meaning of the Act as crew's space. Whenever a Surveyor has any doubt as to whether or not the place which he is called upon to inspect, and for which a deduction from tonnage is sought, is not only a place available for the proper accommodation of, but will be actually occupied by and appropriated for the use of the crew within the meaning of the Act, or is in any difficulty with regard to the amount of space which he should include in his measurements, he will, without delay, submit the facts of the case to the Marine Board. If a difference of opinion upon any of the matters mentioned in the ninth section of the Act or in these instructions should arise between the Surveyor and the owner, agent, master, or builder, from whom he received the application, and such difference of opinion should appear likely to result in a refusal to do what the Surveyor may require, the Surveyor will at once forward to the Secretary, Marine Board, a clear and concise statement of the facts of the case, together with all the correspondence which has passed on the subject, and a sketch, with figured dimensions, of the place in dispute.

35. The Surveyor will see that every place on board any ship that he may be called on to survey is properly provided,

Lighting, ventilation, &c.

constructed, and fitted in accordance with the Act ; but he will in no case express an opinion whether the number of seamen and apprentices for whom accommodation is provided is or is not a sufficient crew for the ship.

Crew spaces in foreign ships.

36. When Surveyors are called in to inspect the crew spaces of foreign ships they should proceed in the same manner as with British ships.

Strength and security of the place in which the seamen are berthed.

37. Upper and lower forecastles which form part of the original and permanent structure of the vessel will in most cases be found to be sufficiently strong and secure, and the Surveyor will only have to search for defects resulting from decay or accident ; but when the seamen are berthed in a deck-house, or in a forecastle which has been raised upon or added to the original structure of the vessel, it will be necessary to examine carefully the mode in which such deck-house or forecastle is built, fitted, and secured, and also to ascertain that it is sufficiently strong to withstand the force of heavy seas which may strike upon or against it. This examination of the strength and security of deck-houses will be especially necessary in the case of the smaller class of sailing vessels.

Seaworthiness and sufficiency of the crew space.

38. Under this head the Surveyor should see that the sides, ends, floor, and top of the spaces appropriated to seamen and apprentices are properly caulked. It will be found beneficial, when the ceiling is caulked, to have air-pipes leading up to the upper or weather deck ; but such openings should be so fitted that they can be closed and made water-tight in cases of necessity. That the side ports or scuttles are properly fitted and in good condition, and that there is no leakage from the deck or water-way seams, or from around the bowsprit, knightheads, catheads, or cattails, fish davits, bulwark stanchions, paulbitt, windlass bitts, or capstan spindle. He should also see that the entrance to lower forecastles is properly protected by a strong companion or booby hatch, built or fitted and secured upon coamings of sufficient height and strength, and that at the entrance to upper or top-gallant forecastles there is a sufficiently deep and strong cant or coaming and a strong athwartship bulkhead. If the hawse holes are in the crew space, the Surveyor should see that properly fitted hawse plugs and hawse bags are provided, or that, by hawse bucklers or slides, or tubes leading from the windlass to the hawse holes, or a manger or other contrivance, water will, as far as practicable, be prevented from entering the screw space through the hawse holes when the cables are unbent, or when the vessel is riding at anchor. When the cables lead down from the deck

into a lower forecastle, the Surveyor should see that there is a proper casing around the cables, or that the pipes through which they lead are fitted with hoods or covers, to prevent water from the deck finding its way below, or effluvium from the chain locker coming up from below.

39. In upper or top-gallant forecastles and in deck-houses there will be little difficulty in affording a sufficient amount of light, either by side ports or skylights, and the Surveyor will determine whether such places are properly lighted; but in lower forecastles there may be some difficulty. The arrangements of the deck overhead may not perhaps admit of the fitting of a skylight, and the vessel may have such a shallow side out of the water that it would not be prudent to have side ports or scuttles fitted. Under these circumstances the Surveyor will consider whether sufficient light may not be admitted through glass prisms or bull's eyes let into the deck, and he will so exercise his knowledge and judgment that a proper amount of light will be admitted without unduly interfering with the deckwork or arrangements of the vessel. A good guide as to the sufficiency of light is that ordinary print may be read in any part of the crew space. Means for
affording light.

40. The Surveyor will have to decide whether the place occupied by the crew is properly ventilated. The simplest method is to have an iron pipe with a revolving cowl, which in lower forecastles must be as high as the bulwarks, fitted at each end or side of the crew space, so that while impure air escapes at one, pure and fresh air will enter at the other, and a constant circulation be kept up. Where such means for ventilation is adopted, one of the ventilators should pass through the deck to at least the lower side of the beams. These pipes may be fitted to unship, and caps be fitted over the holes, when the forecastle is being worked. Mushroom ventilators may be fitted for ventilating deck-houses, but must not be fitted to forecastles, unless they are at least 30 inches high for top-gallant forecastles, but if fitted to lower forecastles they should be at least as high as the bulwarks. Mushrooms should be discouraged in every case excepting deck-houses, and although the Surveyor will not insist on any particular plan he must take care to see that the requirements of the Act regarding ventilation is complied with. Scuttles, companions, and doors are not to be considered as efficient means of ventilating crew spaces. There must always be two ventilators in forecastles and deck-houses, and in lower forecastles they should always come at least to the upper side of the rail. Where a top-gallant forecastle is Ventilation.

divided by two fore and aft bulkheads, with an open space between them, and where cowl ventilators are objected to and cannot be conveniently fitted, two mushroom ventilators of sufficient height may be fitted, placed a few feet abaft the breast beam, each ventilator being a short distance on each side of the centre line of the ship. Openings of sufficient size must be made in the top and bottom of the bulkheads, covered with finely perforated zinc or other material, and fitted with slides or small hinged doors at the top, opening inwards, and so arranged that they can be opened or shut at any time, and fitted with suitable fastenings. If the entrances to the crew's spaces are not in the open passage, jalousies or other ventilating openings with slides to close them must be fitted in the doors.

Privies should be ventilated in a suitable manner, but it will not always be necessary to fit cowls or mushrooms.

Height.

41. The Act does not specify that the space occupied by the crew shall be of any particular height, but it provides that "every such place shall be such as to make the place available for the proper accommodation of the men who are to occupy it"; and it also provides for a minimum amount of cubic capacity, as well as a minimum amount of floor space, per man. In construing the words "available for the proper accommodation," the Surveyor will determine whether the place which he is called upon to inspect is of sufficient height for men of ordinary stature to stand and move about in an upright position—that is to say, at least 5 feet 6 inches between the floor and the under side of the beams—and also of such height that if the sleeping bunks are built in two tiers the bottom of the lower tier will be about 12 inches from the floor, and the bottom of the upper tier at a sufficient distance from the bottom of the lower tier as well as from the deck overhead. The bottom of any bunk must not be less than about 12 inches from the floor. In any case in which there is any difficulty in this respect the Surveyor should report by letter to the Secretary, Marine Board.

Drainage.

42. The Surveyor will see that there are holes, sufficient in number and size, through the cant or coaming of upper forecastles and deck-houses to admit of a ready escape of water, and that there are plugs with lanyards or chains attached fitted to each hole. Where such drainage passes through a privy or other compartment, it will be necessary to have a pipe for the drainage to pass through such privy or compartment with the pipe made perfectly tight through the cant or coaming of the forecastle.

43. The Act requires that every place occupied by seamen shall, as far as practicable, be properly shut off and protected from effluvia which may be caused by cargo or bilge water; the Surveyor must, therefore, see that the bulkheads, sides, and decks of the crew spaces are so fitted, laid, and caulked, and are of such thickness that this provision of the Act is complied with. Scuttles or hatchways opening into a store-room underneath the forecastle may be permitted, provided such scuttles or hatchways are properly fitted, and means provided for screwing down on india-rubber or other suitable soft and elastic substance, so that the store-room or hold underneath is properly shut off from the forecastle. The bulkheads besides being tongued and grooved, should be doubled with felt between, or battened over the seams with felt under the battens.

Protection of the crew space from effluvia arising from cargo or bilge water.

44. It will be the duty of the Surveyor to see that the privy accommodation is as required by the Act in the cases to which this provision of the Act applies, viz., those in which a deduction from tonnage is sought. In small vessels with low bulwarks it may be difficult to arrange an enclosed privy, such as may be easily fitted in larger vessels; but still a strong seat with a shoot or pan passing over or through the ship's side may be fitted, and this may be protected from the weather by a fixed or folding wooden or iron hood, with suitable flaps or doors to enclose the space when occupied. The Surveyor should see that the privies are so built, fitted, and situated, that no unpleasant smell from them will enter the place occupied by the crew; that the seat and pan are securely fixed; and that the scupper or shoot is so made, fitted, placed, and secured; and is in such a condition that it will efficiently answer the purpose for which it is intended. If the spaces are certified for twenty men there should be two privies, or one double one, and so on in proportion to the number certified for.

Privy accommodation.

45. After the Surveyor has inspected the place appropriated to the seamen and apprentices, and has made a note of any defects which may require to be remedied, or any alterations or additions which require to be made, he will send a list of the same to the Marine Board.

List of defects to be sent to Marine Board.

46. The place being first sufficiently cleared and clean, and in a fit state for measurement, measure the length in a straight line from the foremost boundary of the floor of the crew space (whether such foremost boundary be the stem, or knightheads, or water-way, or breast-hook, or a bulkhead, or that part of the floor beyond which men cannot properly stand or move about) to the aftermost boundary of the floor

Rule for computing the superficial area of the deck or floor.

of the crew space. Divide the length so taken into four equal parts. At each of these points of division, and at the foremost and aftermost boundaries of the crew space, take a breadth across the ship, between the boundaries of the side as defined before; number the breadths so taken as No. 1, 2, 3, 4, 5, commencing with No. 1 as the foremost boundary and ending with No. 5 as the aftermost boundary. Multiply the first and last breadths by one, and the second and fourth breadths by four, and the third breadth by two. Then multiply the sum of these products by one-third of the distance or common interval between the breadths, and the product will be the gross area of the floor of the crew space. From this gross area deduct the gross area of all incumbrances, such as hatchways, chain-pipes, ventilating trunks, windlass, riding bitts, &c., and the remainder will be the clear area of the floor. Divide this clear area by 12, and the quotient will be the number of seamen for which the space is to be certified, provided that the cubic capacity of the space (as afterwards computed) is sufficient for such number of men at 72 cubic feet per man. The measurements are to be taken in feet and tenths of a foot. Bed bunks or sleeping berths are not to be deducted as incumbrances, but in cabins there should not be less than 12 square feet per man exclusive of the bunk, as the spirit of the Act is that each man should have 12 clear superficial feet of deck space.

Spaces that are not "available" are not to be included in "crew space."

47. Such parts of the space as are not "available for the proper accommodation of the men who are to occupy it" are not to be included in the measurement (the Surveyor should never measure until all defects or alterations are made good), such, for instance, as the narrow triangular spaces at the forward extremity of the lower forecastles of vessels with very sharp or hollow bows, or the recessed spaces under ladder-ways, or spaces similar to those marked stores on the plan No. 2, Appendix C, which being too narrow and confined for men to stand or move about in, have been bulkheaded off and appropriated for the stowage of small stores, if intended for such purposes, the stores not being the personal property of the crew. He must not measure past the inner side of gutter water-ways, or inner edge of raised covering board, or, if the sides tumble home, past the greatest tumble home of the ship's side, unless the deck beams are more than 5 ft. 6 in. above the floor, then a line taken from a point at the side of the ship 5 ft. 6 in. from the floor, and let fall perpendicularly on to the floor, the point where it touches the floor will be the outer part of the floor space.

48. Multiply the clear area of the floor space by the height from deck to deck at the middle line; the product will be the cubic capacity of the crew space. Divide the cubic capacity thus obtained by 72, and the quotient will be the number of men the place is to be certified to accommodate, provided that there is sufficient area of deck, as before computed, for such number of men at 12 superficial feet per man.

Rule for computing the cubic capacity.

It will thus be seen that the smallest of the quotients obtained by the two calculations will be the number for which the place measured is to be certified.

Plans and calculations to illustrate the above rules are given in Appendix B.

The area and capacity of rectangular deck-houses and cabins may be computed by multiplying together their principal dimensions.

49. If the firemen and coal trimmers are berthed in the same part of the vessel as that in which the crew are berthed, the Surveyor will inspect and measure the space which they occupy, and he will, if the owner wishes it, do the same when they are berthed in a distinct compartment away from the engine-room, or in cabins leading out of the engine-room which have not been included by the Surveyor in the "allowance for propelling power"; but if the cabins leading out of the engine-room have been included in the "allowance for propelling power" the Surveyor will not measure them for crew space allowance under the Act of 1867.

Firemen's places.

50. It is left to the owner's option whether the number a crew's space will accommodate is cut in, or whether it is painted on or over the door of the hatchway leading to such space, but it must be cut in the beam in the inside of such crew's space. In the cases of deck-houses, if the beams are cased, the cutting in of the necessary words on the beam casing may be accepted instead of in the beam itself. Properly and efficiently constructed water-closets below the upper deck, if solely appropriated for the use of the crew, may be treated as crew space, and their capacity deducted from the register tonnage of the vessel.

Number of crew certified for, to be cut or painted on crew space.

Examination of Hulls.

51. Surveyors are to determine whether the hulls of passenger vessels are in good condition and fit for the service for which they are intended; and they are to examine the hulls of such vessels outside and inside once, at least, in every year, and at such a time as is most convenient to the owner.

Outsides to be examined.

Owner should give notice when a vessel is in dry dock at least once every half-year.

52. Delays and inconveniences may, to a great extent, be prevented if notice is given by owners when a vessel, which requires a certificate, is undergoing repairs, or is in dry dock for any other purpose, as this notice might obviate the occasional necessity of re-docking a vessel at an inconvenient time, and at great expense, for the Surveyors to examine the outside of the hull. Surveyors should explain this to owners or their agents whenever an opportunity occurs.

In cases in which the Surveyors decline declarations, in consequence of not having inspected the vessel before the hull was painted and cemented, the owners or builders should be referred to the Board, in order that the Board may decide specially in each such case what steps should be taken.

Before Surveyors finally pass the hull of a vessel they are supposed to see it fit for going into the water.

As to coamings, skylights, scuppers, ports, gratings, &c.

53. The height of the coaming round all openings in the main deck, and the means provided for securely protecting or fastening down all skylights, bunker openings, &c., are important items to be noted by the Surveyors in sea-going vessels coming under their survey, as well as the sufficiency of the water ports and scuppers for relieving the decks of water. All sidelights should be fitted with deadlights, and all stern and other ports in such a manner that they can be quickly and efficiently secured. All openings below the weather-deck in sea-going steam and sailing vessels carrying passengers or emigrants, whether such weather-deck be a poop, awning, spar-deck, or fore-castle, must be fitted with gratings or hatch-covers and tarpaulins, and also with means for effectually securing the tarpaulins down, and making the openings water-tight. Such gratings or hatch-covers must be kept and secured in a suitable place, at all times accessible and near to the openings for which they are intended.

Boats and Life-saving Appliances.

54. For the purposes of these Rules, British ships shall be arranged into the following classes:—

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DIVISION (A).—CLASS 1.

RULES and Table for steamships carrying emigrant passengers subject to all the provision of the "Passengers Acts."

(a) Ships of Division (A), Class 1, shall carry boats placed under davits, fit and ready for use, and having proper appliances for getting them into the water, in number and capacity not less than prescribed by the following table; such boats shall be equipped in the manner required by and shall be of the description defined in the General Rules appended hereto.

(b) Masters or owners of ships of this class claiming to carry fewer boats under davits than are given in the following

table must declare before an officer of the Marine Board before the time of clearance, that the boats actually placed under davits are sufficient to accommodate all persons on board, allowing 10 (ten) cubic feet of boat capacity for each adult person, or "statute adult."

(c) Table for Class 1 (Division A).

Gross tonnage.	Minimum number of boats to be placed under davits.	Total Minimum cubic contents of boats to be placed under davits. L x B x B x '6.
1.	2.	3.
9,000 and upwards	14	5,250
8,500 and under 9,000	14	5,100
8,000 " 8,500	14	5,000
7,750 " 8,000	12	4,700
7,500 " 7,750	12	4,600
7,250 " 7,500	12	4,500
7,000 " 7,250	12	4,400
6,750 " 7,000	12	4,300
6,500 " 6,750	12	4,200
6,250 " 6,500	12	4,100
6,000 " 6,250	12	4,000
5,750 " 6,000	10	3,700
5,500 " 5,750	10	3,600
5,250 " 5,500	10	3,500
5,000 " 5,250	10	3,400
4,750 " 5,000	10	3,300
4,500 " 4,750	8	2,900
4,250 " 4,500	8	2,900
4,000 " 4,250	8	2,800
3,750 " 4,000	8	2,700
3,500 " 3,750	8	2,600
3,250 " 3,500	8	2,500
3,000 " 3,250	8	2,400
2,750 " 3,000	6	2,100
2,500 " 2,750	6	2,050
2,250 " 2,500	6	2,000
2,000 " 2,250	6	1,900
1,750 " 2,000	6	1,800
1,500 " 1,750	6	1,700
1,250 " 1,500	6	1,500
1,000 " 1,250	4	1,200
750 " 1,000	4	1,000
500 " 750	4	800
250 " 500	2	400
150 " 250	2	300

NOTE.—Where in vessels already fitted the required cubic contents of boats placed under davits is provided, although by a smaller number of boats than the minimum required by this table, such boats shall be regarded as complying with these rules as to boats to be carried under davits.

(d) Not less than half the number of boats placed under davits shall be boats of section (a) or section (b). The remaining boats may also be of such description, or may, in the opinion of the shipowner conform to section (c) or section (d), provided that not more than two boats shall be of section (d).

(e) If the boats placed under davits in accordance with the foregoing table (c) do not furnish sufficient accommodation for all persons on board, then additional wood, metal, collapsible, or other boats of approved design (whether placed under davits, or otherwise), or approved life-rafts shall be carried. One of these boats may be a steam launch; but in that case the space occupied by the engines and boilers is not to be included in the estimated cubic capacity of the boat.

Subject to the provisions contained in paragraph (g) of these rules, such additional boats or rafts shall be of at least such carrying capacity that they and the boats required to be placed under davits by table (c), provide together in the aggregate three-fourths more than the minimum cubic contents required by column 3 of that table. For this purpose 3 cubic feet of air case in the life-raft is to be estimated as 10 cubic feet of internal capacity. Provided always that the rafts will accommodate all the persons for which they are to be certified under the rules. All such additional boats or rafts shall be placed as conveniently for being available as the ship's arrangements admit of, having regard to the avoidance of undue encumbrance of the ship's deck, and to the safety of the ship for her voyage.

(f) In addition to the life-saving appliances beforementioned, ships of this class shall carry not less than one approved life-buoy for every boat placed under davits.

They shall also carry approved life-belts, or other similar approved articles of equal buoyancy suitable for being worn on the person, so that there may be at least one for each person on board the ship.

(g) Provided, nevertheless, that no ship of this class shall be required to carry more boats or rafts than will furnish sufficient accommodation for all persons on board.

DIVISION (A)—CLASS 2.

RULES for foreign-going steamships having passenger certificates under the Merchant Shipping Acts.

Ships of this class shall be subject to the same requirements as those in Division (A), Class 1.

DIVISION (A)—CLASS 3.

RULES for steamships having passenger certificates under the Merchant Shipping Acts authorising them to carry passengers anywhere within the jurisdiction of the Marine Board.

(a) Ships of this class shall carry boats placed under davits in accordance with the rules and tables provided for ships in Division (A), Class 1.

(b) If the boats placed under davits in accordance with this requirement do not furnish sufficient accommodation for all persons on board, then additional wood, metal, collapsible or other boats of approved description (whether placed under davits or otherwise), or approved life-rafts, shall be carried of at least such cubical capacity that they and the boats required to be placed under davits by table (c) provide together in the aggregate one-half more than the minimum cubic contents provided by column 3 of that table.

(c) Provided that if (having regard to the avoidance of undue encumbrance of the ship's deck, and to the safety of the ship for her voyage) it is not practicable for any ship of this class to carry all the additional approved boats, or approved life-rafts required by the preceding sub-section (b), the deficiency so called may be made up by the supply of an equivalent number of approved buoyant deck seats, or other approved buoyant deck fittings.*

(d) Ships of this class shall carry not less than six approved life-buoys.

(e) They shall also carry, in addition to the boats and appliances required above, approved life-belts, or other similar approved articles of equal buoyancy suitable for being worn on the person, so that there may be at least one for each person on board the ship.

(f) Provided, nevertheless, that no ship of this class shall be required to carry more boats, rafts, and other buoyant deck fittings than will furnish sufficient accommodation for all persons on board.

DIVISION (B)—CLASS 1.

RULES for sailing ships carrying emigrant passengers subject to all the provisions of the Passenger Acts.

(a) Ships of Division (B).—Class 1 shall carry boats in accordance with the table (c) provided for Division (A)—Class 1, and such boats shall be as far as practicable placed

under davits, with proper appliances for getting them into the water. All boats not placed under davits are to be so carried that they can be readily got into the water.

(b) If the boats so carried do not furnish sufficient accommodation for all persons on board, then additional life-saving appliances shall be supplied as for ships in Division (A), Class 1.

(c) Provided that no ship in this class shall be required to carry more boats or rafts than will furnish accommodation for all persons on board.

(d) Approved life-belts or other similar approved articles shall be carried as required for ships of Division (A), Class 1, and also one life-buoy for each boat of wood or metal.

DIVISION (B)—CLASS 2.

RULES for foreign-going sailing ships carrying passengers, but not subject to all the provisions of the "Passenger Acts."

Ships of this class shall be subject to the same requirements as those in Division (B), Class 1.

DIVISION (B)—CLASS 3.

RULES for foreign-going sailing ships not carrying passengers.

(a) Ships of this kind shall carry a boat or boats of sections *a* or *b*, sufficient for all the persons on board, and in addition thereto one good serviceable boat of section *d*. Such boats shall be, as far as practicable, placed under davits with proper appliances for getting them into the water; all boats not placed under davits are to be so carried that they can readily be got into the water to the satisfaction of the Marine Board Officer.

(b) They shall carry approved lift-belts as required for ships in Division (B), Class 1, and also one life-buoy for each boat of wood or metal.

DIVISION (B)—CLASS 4.

RULES for foreign-going steamships not certified to carry passengers.

(a) Ships of this class shall carry, on each side, at least so many and such boats of wood or metal placed under davits (of which one on one side shall be a boat of section (a) or

section (b) or section (c). That the boats on each side of the ships shall be sufficient to accommodate all persons on board. They shall have proper appliances for getting the boats into the water.

(b) They shall carry approved life-belts as required for ships of Division (B), Class 1.

(c) They shall carry not less than six approved life-buoys.

DIVISION (C)—CLASS 1.

RULES for Steamships not certified to carry passengers anywhere within the jurisdiction of the Marine Board.

(a) Ships of this class shall carry, on each side, at least and so many and such boats of wood or metal placed under davits (of which one on each side shall be a boat of section (a) or of section (b) or of section (c). That the boats on each side of the ship shall be sufficient to accommodate all persons on board. They shall have proper appliances for getting the boats into the water.

(b) They shall also carry approved life-belts so that there may be at least one for each person carried on board the ship.

(c) They shall also carry not less than four approved life-buoys.

DIVISION (C)—CLASS 2.

RULES for Sailing Ships in the same trades not carrying passengers.

(a) Ships of this class shall carry a boat or boats of wood or metal at least sufficient for all persons on board, and in such a position as to be readily got into the water. Each boat shall be provided with one gallon of vegetable oil or animal oil and a vessel of approved pattern for distributing it in the water in rough weather.

(b) Ships of this class shall also carry an approved life-belt for each person on board.

(c) They shall also carry at least two approved life-buoys.

DIVISION (D)—CLASS 1.

RULES for Steamships having passenger certificates authorising them to carry passengers within certain specified limits on the coast of New South Wales.

(a) Ships of this class shall, according to their tonnage, carry boats placed under davits, as required by the Table for Ships in Division (A), Class 1; but all such boats as are not required to be of section (a) or (b) must be of section (c).

(b) If the boats placed under davits, in accordance with the above requirements, do not furnish sufficient accommodation for all persons on board, then additional wood, metal, collapsible, or other boats of approved description (whether placed under davits or otherwise), or approved life-rafts, shall be carried of such cubical capacity that they and the boats required to be placed under davits by Table (c) provide together in the aggregate one-half more than the minimum cubic contents provided by column 3 of that table.² For this purpose, 3 cubic feet of air-case in the life-raft is to be estimated as 10 cubic feet of internal capacity: Provided always that the rafts will accommodate the persons for which they are certified under the rules.

(c) Provided that if (having regard to the avoidance of undue encumbrance of the ship's deck, and to the safety of the ship for her voyage), it is not practicable for any ship of this class to carry all the additional approved boats or approved life-rafts required by the preceding sub-section (b), the deficiency so caused may be made up by the supply of an equivalent number of approved buoyant deck seats or other approved buoyant deck fittings.

(d) Ships of this class shall also carry approved life-belts, or other similar approved articles of equal buoyancy suitable for being worn on the person, so that there may be at least one for each person on board the ship.

(e) At least one approved life-buoy shall also be provided for each boat of wood or metal carried by the ship, but in no case shall less than six approved life-buoys be provided.

(f) Provided, nevertheless, that no ship of this class shall be required to carry more boats, rafts, and other buoyant deck fittings than will furnish sufficient accommodation for all persons on board.

DIVISION (D)—CLASS 2.

RULES for Steamships carrying passengers on short excursions or pleasure-trips to sea, or in estuaries or mouths of rivers.

(a) Ships of this class shall carry at least two boats of section (a) or section (b) or section (c), placed under davits, and with proper appliances for getting them into the water.

(b) They shall also carry other boats, approved buoyant apparatus, and approved life-belts sufficient (with the boats required by paragraph a) to keep afloat all the persons on board the ship.

(c) At least six approved life-buoys shall be carried.

DIVISION (D)—CLASS 3.

RULES for Steamships carrying Passengers on Rivers or Lakes, but not going to sea or into rough waters.

(a) Ships of this class shall carry one boat in such a position that she can readily be got into the water. They shall also carry approved buoyant apparatus or approved life-belts and approved life-buoys at least sufficient, together with the boat, to keep afloat all persons carried on board.

(b) At least six approved life-buoys shall be carried.

NOTE.—A discretion may be exercised by the Marine Board to relieve steam launches, steamers plying in narrow waters, and ferry boats from the operation of the whole or part of Rule (a) of this class.

General Rules respecting Life-saving Appliances.

Cubic capacity

55. (1.) All boats shall be constructed and properly equipped, as provided by these Rules, and all boats and other life-saving appliances are to be kept ready for use, to the satisfaction of the Marine Board.

All the boats should be lowered into the water at every survey.

Internal buoyancy apparatus may be constructed of wood or of copper or yellow metal, of not less than 18 oz. to the superficial foot, or of other durable material.

Section (a).—A boat of this section shall be a life-boat of whale-boat form, properly constructed of wood or metal, having for every 10 cubic feet of her capacity, computed as in Rule 2, at least 1 cubic foot of strong and serviceable enclosed air-tight compartments, so constructed that water cannot find its way into them.

Section (b).—A boat of this section shall be a life-boat of whale-boat form, properly constructed of wood or metal, having inside and outside buoyancy apparatus together equal in efficiency to the buoyant apparatus provided for a boat of section (a). At least one-half of the buoyancy apparatus must be attached to the outside of the boat.

Section (c).—A boat of this section shall be a life-boat, properly constructed of wood or metal, having some buoyancy apparatus attached to, the inside and outside of the boat equal in efficiency to one-half of the buoyancy apparatus provided for a boat of section (a) or section (b). At least one-half of the buoyancy apparatus must be attached to the outside of the boat.

Section (d).—A boat of this section shall be a properly-constructed boat of wood or metal.

Section (e).—A boat of this section shall be a boat of approved construction, form, and material, and may be collapsible.

(2.) The cubic capacity of a boat shall be deemed to be her cubic capacity, ascertained (as in measuring ships for tonnage capacity, by Stirling's rule); but as this application of that rule entails much labour, the following simple plan, which is approximately accurate, may be adopted for general purposes; and when no question requiring absolute correct adjustment is raised, measure the length and breadth outside and the depth inside. Multiply them together, and by $\cdot 6$; the product is the capacity of the boat in cubic feet. Thus, a boat 28 ft. long, 8 ft. 6 in. broad, and 3 ft. 6 in. deep, will be regarded as having a capacity of $28 \times 8 \cdot 5 \times 3 \cdot 5 \times \cdot 6 = 499 \cdot 8$ ft., or 500 cubic feet. If the oars are pulled in rowlocks, the bottom of the rowlock is to be considered the gunwale of the boat for ascertaining her depth.

Number of persons for boats.

(3.) The number of persons a boat of section (a) shall be deemed fit to carry shall be the number of cubic feet ascertained as in Rule 2, divided by 10.

* The number of persons a boat of section (b), (c), (d), or (e) shall be deemed fit to carry shall be the number of cubic feet ascertained, as in Rule 2, divided by 8.

The space in the boat shall be sufficient for the seating of the persons carried in it, and for the proper use of the oars.

(4.) Appliances for getting a boat into the water must fulfil the following conditions :—Means are to be provided for speedily, but not necessarily simultaneously or automatically, detaching the boats from the lower blocks of the davit tackles. The boats placed under davits are to be attached to the davit tackles and kept ready for service; the davits are to be strong enough, and so spaced that the boats can be swung out with facility; the points of attachments of the boats to the davits are to be sufficiently away from the ends of the boats to insure their being easily swung clear of the davits; the boat chocks are to be such as can be expeditiously removed; the davits, falls, blocks, eyebolts, rings, and the whole of the tackling are to be of sufficient strength; the boat falls are to be long enough to lower the boat into the water with safety when the vessel is light; the life-lines shall be fitted to the davits and be long enough to reach the water when the vessel is light; and hooks are not to be attached to the lower tackle blocks.

Appliances for lowering boats &c.

Equipments for collapsible or other boats, and for life-rafts.

(5.) In order to be properly equipped, each boat shall be provided as follows :—

- (a) With the full single-banked complement of oars, and two spare oars.
- (b) With two plugs for each plughole, attached with lanyards or chains, and one set and a half of thole-pins or crutches, attached to the boat by sound lanyards.
- (c) With a sea anchor, a bailer, a rudder and tiller, or yoke and yoke-lines ; a painter of sufficient length and a boat-hook. The rudder and bailer to be attached to the boat by sufficiently long lanyards, and kept ready for use. In boats where there may be a difficulty in fitting a rudder, a steering oar may be provided instead.
- (d) A vessel to be kept filled with fresh water shall be provided for each boat.
- (e) Life-rafts shall be fully provided with a suitable approved equipment.

Additional equipments for boats of section (a) and section (b).

(6.) In order to be properly equipped, each boat of sections (a) and (b), in addition to being provided with all the requisites laid down in rule (5), shall be equipped as follows, but not more than four boats in any one ship require to have this outfit :—

- (a) With two hatchets or tomahawks, one to be kept in each end of the boat, and to be attached to the boat by a lanyard.
- (b) With a mast or masts, and with at least one good sail, and proper gear for each.
- (c) With a line becketed round the outside of the boat and securely made fast.
- (d) With an efficient compass.
- (e) With one gallon of vegetable or animal oil, and a vessel of an approved pattern for distributing it in the water in rough weather.
- (f) With a lantern trimmed, with oil in its receiver sufficient to burn eight hours.

Number of persons for life-rafts.

(7.) The number of persons that any approved life-raft for use at sea shall be deemed to be capable of carrying, shall be determined with reference to each separate pattern approved by the Marine Board.

Provided always that, for every person so carried, there shall be at least 3 cubic feet of strong and serviceable enclosed air-tight compartments, constructed so that water cannot find its way into them. Any approved life-raft of other

construction may be used, provided that it has equivalent buoyancy to that hereinbefore described. Every such approved life-raft shall be marked in such a way as to plainly indicate the number of adult persons it can carry.

(8.) Approved buoyant apparatus shall be deemed sufficient, so far as buoyancy is concerned, for a number of persons, to be ascertained by dividing the number of pounds of iron which it is capable of supporting in fresh water by thirty-two. Such buoyant apparatus shall not require to be inflated before use, shall be of approved construction, and marked in such a way as plainly to indicate the number of persons for whom it is sufficient. Buoyant apparatus.

(9.) An approved life-belt shall mean a belt which does not require to be inflated before use, and which is capable at least of floating in the water for twenty-four hours, with 15 lb. of iron suspended from it. Life-belts.

Life-belts are to be cut out 2 inches under the armpits, and fitted so as to remain securely in their place when put on.

Life-jackets must be provided for the crew and coxswains of all life-boats, and no life-jacket shall be passed that is not capable of floating in the water for twenty-four hours with 23 lb. of iron suspended from it; and to ensure this buoyancy, a life-jacket, in which the cork must be exposed, and have a canvas back and straps only, should, when dry, weigh 5 lb.

(10.) An approved life-buoy shall mean either :— Life-buoys.

- (a) A life-buoy built of solid cork, capable of floating in the water for at least twenty-four hours with 32 lb. of iron suspended from it; and should not be less than 2 feet 6 inches in diameter (outside).
- (b) A strong life-buoy of any other approved pattern and material, provided that it is capable of floating in the water for at least twenty-four hours with 32 lb. of iron suspended from it, and provided also that it is not stuffed with rushes, cork shavings or other shavings, or loose granulated cork or other loose material, and does not require inflation before use.

All life-buoys shall be fitted with beackets securely seized, and not less than two of them shall be fitted with life-lines 15 fathoms in length.

(11.) All life-buoys and life-belts shall be so placed as to be readily accessible to all persons on board, and so that their position may be known to those for whom they are intended. Position of life-buoys and life-belts.

Watertight
compartments.

(12.) When ships of any class are divided into efficient watertight compartments to the satisfaction of the Marine Board, they shall only be required to carry additional boats, rafts, and other life-saving appliances of one-half of the capacity required by these Rules.

Instructions as to Interpretation of Rules respecting Life-saving Appliances.

Boat accommo-
dation to be
provided.

56. With respect to the interpretation of paragraph (e) Division (A), Class 1, the Board desire specially to call attention to the following observations:—Vessels (excepting those coming under the description of Classes 3 and 4 of Division (B), and Class 1 of Division (C), should not be required to carry more boats, whether under davits or otherwise, than will accommodate all the persons on board.

The number of boats required by the table, Division (A), Class 1, to be carried under davits, must not be decreased under paragraph (b) unless sufficient boats are left under davits to accommodate all the persons on board, allowing 10 cubic feet of capacity for each adult; but when this is the case the requirements of paragraph (e) are to be regarded as complied with.

As regards the boats of sections (a), (b), (c), and (d), Rule 1; the Surveyors will see that the requirements of the Rules are observed, and that the capacity of the boats, and the number of persons they are fit to carry, are ascertained by Rules 2 and 3. The number of persons for which a boat is to be passed is, however, subject to the further condition that the space in the boat shall be sufficient for the seating of them all, and the proper use of the oars. That this requirement is fulfilled must be ascertained by practical experiment in all cases before a declaration is granted, unless one or more boats in a ship are of the same pattern, when one only of such boats need be so tested. All collapsible boats, and all boats whether collapsible or not, if constructed of any material other than wood or metal, must be in accordance with a pattern approved by the Marine Board before they are passed as a portion of the life-saving appliances required by the Rules.

Stowage of
boats.

57. All boats required by the Rules to be placed under davits are to be kept fit and ready for use, and when they are swung inboard and resting on the chocks, the chocks are to be so constructed that the boat can at once be swung out-board without requiring to be lifted by the tackle, that is, it should not be necessary to do more than take the weight of the boat.

The manner in which the additional boats not requiring to be placed under davits are to be stowed will vary in different ships, but they must be stowed to the satisfaction of the Surveyors, so as to be as readily available for use as is practicable, having due consideration to the circumstances mentioned in the Rules.

58. Life boats (except those of section (c) should be built Life-boats. whaleboat fashion, both ends alike.

In ships which have been fitted with boats previous to the Rules coming into force, square-stemmed boats need not be condemned if fitted with the required amount of buoyancy, but all life-boats of sections (a) and (b) subsequently supplied, or supplied to new ships, must be built whaleboat fashion.

The inside buoyancy for boats of section (a), (b), (c) must Buoyancy. consist of strong and serviceable enclosed air-tight compartments such that water cannot find its way into them.

The outside buoyancy for boats of section (b) must consist of solid cork covered with canvas, and painted and attached to the outer skin of the boat to the satisfaction of the Surveyors, both as regards its position and also as regards its attachment. No other material is to be used unless expressly sanctioned by the Marine Board. The outside buoyancy must be equal to at least half the buoyancy required for boats of section (a), and the inside and outside buoyancy together must equal in *efficiency* the buoyancy required for a boat of section (a).

To effect this 1.25 cubic feet of cork is to be considered as equivalent to (one) 1 cubic foot of air case.

The foregoing remarks apply to outside buoyancy for boats of section (c), excepting that the total buoyancy is only required to be half that of boats of section (a) or section (b).

When the solid cork is not permanently attached to the side of a boat in such manner that moisture cannot collect between the two surfaces, it will require to be removed every time a declaration is granted to ascertain (1) whether the cork is becoming sodden; (2) whether moisture is collecting between the cork and the skin of the boat, and in that way rotting the wood.

The consideration (2) will not apply to metal boats.

Air-cases are required by the rules to be constructed of Air-cases. wood or copper or yellow metal of not less than 18 oz. to the superficial foot, or of other durable material.

The average weight of 18 oz. copper air-cases is about 5 lb. per cubic foot, and if air-cases of other material exceed this weight the public capacity of the air-cases must be correspondingly increased.

As yellow metal becomes in time exceedingly brittle, copper is far preferable. Zinc is not durable material, and should not be passed.

Iron air-cases have not been found to answer in practice, but should they be fitted the plating is not to weigh less than 21 oz. per square foot before galvanising.

A note should be made in each district of all ships whose boats are fitted with galvanised iron or steel air-cases, with a view to their being frequently inspected.

Steel or iron air-cases previously passed of less thickness than 21 oz. are not to be rejected so long as they continue in good condition.

Copper and yellow metal air-cases are to be made with proper hook joints not less than three-eighths ($\frac{3}{8}$) of an inch in width, hammered well down and soldered, and no other joint is to be passed unless specially approved by the Marine Board.

The cases are not to exceed 4 feet in length; they are to be substantially enclosed with wood, which is to be close-jointed so as to cover any exposed part of the air-case, and the wood forming the top is not to be less than 1 inch in thickness.

The coverings in the boats over the air-cases should be secured with brass screws, so as to enable the cases to be removed without difficulty for examination.

Spaces filled with or containing any material are not to be deemed air-spaces unless specially approved by the Marine Board.

Copper or yellow metal air-cases must not be carried in contact with the skin of the metal boats.

Where boats are not required by the rules to be fitted with air-cases are so fitted, as, for instance, in some of the collapsible or semi-collapsible boats, these provisions as to air-cases need not be insisted upon.

Rudder.

In some of the collapsible boats it is difficult to fit a rudder; in this case a steering oar properly fitted may be passed instead.

Boats already supplied.

In carrying these instructions into effect, Surveyors are to be careful not to interfere unnecessarily with boats supplied before June, 1892; but in the case of new boats coming under survey for the first time, as well as in all cases in which the fittings of the boats require renewal, the rules contained in these instructions are to be strictly adhered to.

Appliances for lowering boats.

59. The Surveyor should also report to the Marine Board of any particular disengaging gear that has been inspected

and deemed unsatisfactory or unsafe, and should explain fully in such report the details which, in his opinion, render it undesirable.

No formal certificate of approval will, however, be granted by the Marine Board or their officers for any special kind of gear.

The equipments for all boats are provided for in the rules, Equipments. and Surveyors are to see that the requirements are carefully complied with.

The painter for boats is not to be less than 20 fathoms in length.

These appliances must be in accordance with Rule 4 of the General Rules, and must, in the Surveyor's opinion, be such as not to endanger human life. Appliances for lowering boats.

The question of determining whether the requirements of the rules respecting appliances for lowering boats are complied with in the case of any particular kind of gear coming under the Surveyor's notice shall be left to the principal officers of the Marine Board.

60. Life-rafts are to be approved by the Marine Board. Life-rafts and buoyant apparatus. They are to be supplied with a suitable equipment, to the satisfaction of the Surveyors, and this must include a sea anchor, not less than 20 fathoms of hawser, and oars in proportion to the size of the raft.

The number of persons that any approved life-raft for use at sea is to be deemed capable of carrying is the number that the raft is able to seat safely, provided always that for every person so carried there are at least 3 cubic feet of strong and serviceable enclosed air-tight compartments.

Buoyant apparatus under the rules is only applicable to Classes 3 of Division A, and 1, 2, 3, Division D.

Approved buoyant apparatus is to be deemed sufficient Buoyant apparatus. for a number of persons, to be ascertained by dividing the number of pounds of iron which it is capable of supporting in fresh water by 32, provided also that the sides and ends of the apparatus shall afford a space of 1 horizontal foot for each person for whom it is certified, and that a line for the people to cling to is properly becketed all round it. Such buoyant apparatus shall not require to be inflated before use, and shall be of approved construction.

Surveyors will note that both rafts and buoyant apparatus Marking shall be marked in such a way as to plainly indicate the number of adult persons for which they are deemed sufficient.

Plates will be supplied by the Marine Board, to be screwed on to the woodwork of both rafts and buoyant apparatus, indicating this number.

Air-cases.

The instructions in the case of life-boats apply equally to life-rafts and buoyant apparatus, so far as the length, weight, and enclosure of the air-cases are concerned, excepting that as life-rafts and buoyant apparatus are only intended to be used in cases of extreme need, and are, consequently, not exposed to the same wear and tear as the life-boats, a minimum weight of 16 oz. copper or yellow metal may be passed.

Life-belts.

61. No life-belt is to be passed that is not capable of floating in fresh water for twenty-four hours with 15 lb. of iron suspended from it. It should be cut out 2 inches under the armpits, and fitted so as to remain securely in its place when put on.

When any other material than solid cork is used for buoyancy, it must be specially approved by the Marine Board.

Life-buoys.

62. No life-buoy stuffed with rushes, or with cork shavings, or granulated cork, or any loose material, is to be passed. All cork life-buoys are to be built on solid cork and fitted with lines becketed and securely seized to the life-buoy, and none are to be passed that will not float for twenty-four hours in fresh water with 32 lb. of iron suspended from them. If life-buoys are not made of solid cork, the pattern and material must be approved by the Marine Board.

No contrivance is to be passed as a life-buoy that requires inflation before use.

Life-buoys are to be secured by a toggle and becket, or any other similar method, so that they can be quickly released; they must not be lashed nor seized to the rail or any other part of the vessel, but must be kept so as to be ready for use at a moment's notice in case of an emergency.

Life-buoys are in all cases to be carefully examined by the Surveyors, who will satisfy themselves of their buoyancy, and see that the materials of which they are composed have not become sodden, and that the lines attached to them are sufficient. Not less than two of the life-buoys, one on each side of the ship, are to be fitted with life-lines 15 fathoms in length.

Vessels for distributing oil are to be to the satisfaction of the Surveyors, and are to be so constructed as to distribute the oil evenly and gradually on the surface of the water.

Exemptions in respect of watertight compartments.

63. In all cases in which claims are made for the exemptions allowed under Rule 12, for vessels which are divided into efficient watertight compartments, the Surveyors are to report full particulars to the Marine Board, and state

whether, in their opinion, the bulkheads and the arrangements for promptly closing any openings therein are efficient and satisfactory; but no exemptions will be made under Rule 12 (par. 55) until further instructions are issued.

Before the Marine Board exempt steam-launches, steamers, and ferry-boats from the operation of the whole or part of Rule (a), Division D, Class 3, they will require the owners to furnish them with particulars as to what reasonable provision they propose to make to save life in case of casualty. Exemptions of ferry-boats, &c.

64. In every case the application for approval of boats, life rafts, buoyant apparatus, must be made by a shipowner who proposes to carry the particular appliance on board his ship, if approved, and the Marine Board must decline to examine, test, or express any opinion whatever upon any such appliance except on this condition. Approval of appliances.

Miscellaneous.

65. The compasses of every sea-going steamship employed to carry passengers, and holding a Marine Board certificate, must be properly adjusted when such steamship is having her survey, twice a year, as hereinbefore provided. Swinging of ships and adjusting compasses.

Competent persons have been licensed to swing ships and furnish deviation cards, and no deviation card will be recognised unless it bears the signature of one of the persons so licensed.

66. There should be in each compartment a pump of sufficient size which can be worked from the upper deck, and a rose or perforated box of sufficient size for each pump. Deck pumps to be fitted.

It is very desirable that the steam winches (if any) be so fitted and arranged that the deck pumps can be worked by them.

Deck pumps, when not worked by machinery, should have handles at least long enough for two men to work at them.

67. There should be fitted at the bottom of each bulkhead a valve or cock, which can be opened and shut from the upper deck, and there must be means for ascertaining the depth of water in each compartment, and also means for clearing the end of the suction pipe. When, in order to get at the end of the suction pipe, there is a trunk-way leading from the upper deck to the suction of each pump, large enough for a man to go down to clear the end of the suction pipe, no question need be raised. Valves, sounding pipes, &c.

68. The collision bulkhead should not have a valve or cock or any opening in it, nor should pipes be led through it. Collision bulk-head should not have valves in it.

Engine-room
pumps.

69. Pipes, connected with pumps worked by the engines, are also to be carried through the bulkheads into the compartments fore and aft of the engine-room, so that each compartment can be pumped out separately by the engines as well as by the deck pump. The pipes should be well secured where they pass through the bulkheads, and it is very desirable that cocks or valves be fitted between these suction pipes and the bulkheads, to be capable of being opened or shut from the upper or main deck.

Pumps not
necessary in
fore-peak, &c.

70. In all sea-going screw vessels there should be a strong water-tight deck over the cast-iron tube aft, so as to make a tank round the tube, and a properly fitted man-hole at the top or fore end, and collision bulkheads must be fitted in sea-going vessels. If they are not fitted, the Surveyor should decline to grant a declaration before consulting with and getting the decision of the Marine Board. These places are generally small, and the Surveyor should not insist on a separate deck pump leading direct into them.

Steering gear.

71. The steering gear should not be too rigid amongst the gearing, as severe and sudden shocks, such as a sea hitting the rudder, are liable in such cases to carry something away. A spare tiller, properly fitted to the rudder head, relieving tackles, &c., should, in all steamers, be kept near the after-steering gear, ready for immediate service. Rudder pendants should also be securely fastened to the back of the rudder, with their ends led up to a place accessible in all weathers. In any case where the Surveyor is not satisfied that the rudder pendants are not made fast, so as to have sufficient power over the rudder, he should see that an efficient bumpkin is securely fitted, to which the rudder pendants must be made fast. Stops should be fitted on the rudder to prevent it going too far over or damaging the screw gear by the nuts travelling too far. If any cases are discovered where stops are improperly fitted, or are not fitted at all (and they cannot be fitted afloat), extra grumets or india-rubber washers should be fitted between the nuts on the screw gear; but stops, properly fitted, should be put on the first time the vessel goes into dry dock. The steering gear should be thoroughly overhauled at every survey, and taken to pieces and thoroughly examined at least once a year. The chains and blocks that are liable to interfere with or endanger the passengers or crew should be guarded by portable but properly secured guards.

Attention is also directed to a description of steam steering gear, in which a part of the shaft by which the helmsman actuates the controlling valve passes through another

shaft that is liable to be thrown out of line by the reaction of the spur gearing, and, consequently, liable to jam the inside shaft to such an extent as to deprive the helmsman of the control of the steering gear.

All steam steering gear should be carefully examined, and if any be found constructed in the manner described above, their use should be discouraged and should not be approved, unless they have been tested from midship to hard over in both directions and found satisfactory when the vessel is running at full speed. It is very desirable that the man at the helm should be so placed that he has a clear lookout ahead, more especially in steamers that frequent crowded harbours or rivers.

72. A deep-sea lead-line of at least 120 fathoms, a lead of at least 28 lb. weight, and a suitable reel, together with at least two hand lines of at least 25 fathoms, and leads of at least 7 lb., should be supplied to all foreign-going steamers. In home-trade steamers two hand lead-lines of 25 fathoms each, and leads of at least 7 lb. must be demanded. These are regarded as the minimum requirements. For a 1st class (*i.e.*, twelve months) declaration double the number of lines and leads should be provided. The Surveyor should see that the lead-lines are properly marked. The following marks are those usually adopted :—

At	2 fathoms,	a piece of leather split in two strips.
"	3	" " " " three strips.
"	5	" " " " white bunting.
"	7	" " " " red bunting.
"	10	" " " " leather with a hole.
"	13	" " " " blue bunting.
"	15	" " " " white bunting.
"	17	" " " " red bunting.
"	20	" " " " a strand with two knots tied in it.

It is always best to have the lines fitted with calico or white marks, bunting for red marks, and serge for blue marks, because a man can tell the difference by the feel in the dark. All sea-going ships to have a commercial code and book.

73. Surveyors must be very careful to see that each steamship they survey is provided with chain cables and anchors duly certified or passed. They will also see that the chain cables and anchors on board are sufficient for the service, and in good condition. Proper hawsers and warps must also be supplied.

The spare anchors should not be stowed below, but kept where they will be ready for use in case they are required.

Lead-lines and commercial code of signals.

Anchors, chains, cables, hawsers, warps, &c.

The Surveyors must also see that the chain cables and anchors are removed from the chain lockers at least once in twelve months, cleaned if necessary, and the pins knocked out of the shackles.

The shackle pins should be secured by small pins of hardwood.

The signals specified in the first schedule of the Imperial Act of 1873 shall be deemed to be signals of distress.

Statutory distress signals.

74. *In the daytime.*—The following signals, numbered 1, 2, and 3, when used or displayed together or separately, shall be deemed to be signals of distress in the daytime:—
1. A gun fired at intervals of about a minute. 2. The international code signal of distress indicated by N.C. 3. The distant signal, consisting of a square flag, having either above or below it a ball, or anything resembling a ball.

At night.—The following signals, numbered 1, 2, 3, when used or displayed together or separately, shall be deemed to be signals of distress:—
1. A gun fired at intervals of about a minute. 2. Flames on the ship (as from a burning tar barrel, oil barrel, &c.). 3. Rockets or shells, of any colour or description, fired one at a time at short intervals.

Rockets, blue-lights, &c., to be examined.

75. The means for making signals of distress are to be carefully examined by the Surveyors, to see that they are kept dry and in good order, and are protected from fire and accident; and that the cannon or mortar, which should be of at least the sizes hereafter specified, is in good condition and ready for use. The means for making flames should be lights that burn in water, or some other approved arrangement.

Description of signals to be provided, guns, &c.

76. The signals should be twelve blue lights, two of Holmes' storm or danger signal lights, and six of the smaller lights, of the same description, with means for attaching them to life-buoys; twelve rockets, each containing 16 oz. of composition; one gun at least $3\frac{1}{2}$ in. in the bore, or one mortar at least $5\frac{1}{2}$ in. in the bore, with 24 charges of ammunition, or in the case of limited coast trade or excursion passenger steamers or ships 12 charges. Blue lights to contain 10 oz.

The rocket distress signals of the Cotton Powder Company may, however, be passed as sufficient for signals of distress in lieu of both guns and rockets, provided the signals supplied be equal in number to the number of rockets and charges (for guns) above specified, and the Crundall distress signals may be passed in lieu of rockets on the same conditions. When a gun is carried, each charge should contain 16 oz. of pebble or bean powder in a flannel bag. An airtight copper magazine, rammers, sponges, wads, priming wires, friction tubes, powder flask with fine powder for

priming, and means for firing and withdrawing charges should be provided and carefully examined. The Holmes' patent storm and danger signal lights should be supplied to each foreign-going and intercolonial trade vessel.

They need not be supplied to vessels having only daylight excursion certificates; but it should be understood that if such vessels are found plying after dark unprovided with these signals, the owners will be held responsible.

77. As pyrotechnic signals of distress which have been kept for a lengthened period are liable to seriously deteriorate in quality, and are consequently not to be relied on when required for use, they should not be passed for use upon passenger and emigrant ships when they are more than two years old. In the case of pyrotechnic signals which are less than twelve months old, the surveyors should test by firing at least one sample of each description of signal supplied; but of signals between one and two years old double this number should be fired. Any signals showing signs of dampness, careless manufacture, or unusual wear and tear, should be regarded with suspicion, and should be dealt with in such a way as the Surveyor may think most expedient.

To enable the Surveyors to carry the foregoing Regulations into effect, all pyrotechnic signals must be marked with the date of manufacture. The marking should be distinct, and should not be effected by means of an adhesive label.

With reference to the Holmes' signals, Surveyors are informed that these signals, when kept on the rail ready for use, or otherwise exposed to the action of the weather, very quickly deteriorate, and are not to be relied on for more than twelve months. This also applies to Holmes' signals that have been kept in damp lockers, wheel houses, or other places where they are exposed to moisture. On the other hand, when efficiently taken care of, these signals have been known to remain good for a number of years.

Surveyors should, therefore, examine them carefully.

They should be marked with the date of manufacture in the same way as other pyrotechnic signals, but must be dealt with as the circumstances of each case require.

78. Before granting clearances for emigrant ships, or declaration for passenger steamers, the Surveyor should in all cases see that a separate, detached, and completely enclosed receptacle is provided for *each* of the following description of explosives:

- (1) Gunpowder and cannon cartridges made with gunpowder; (2) rockets; (3) socket signals; (4) blue lights; (5) Holmes' lights; (6) for each description of pyrotechnic signals not mentioned above.

Pyrotechnic
signals.

Stowage of
combustibles.

These separate receptacles should not be made merely by divisions, or partitions, in a cupboard or locker, or chest, but must be separate magazines exclusively appropriated to the keeping of the explosives. They should, when possible, be kept in a house on deck, and stowed or ranged as far apart as circumstances will permit, so that in the event of spontaneous combustion in any case, or of risk of any sort arising, any of the cases (as may be necessary) may be at once removed.

The rocket signals are usually supplied in metal boxes, with the friction tubes. When this is so, no other receptacle is required for the latter.

No article of an explosive or highly inflammable character should be carried in any room or place in which any receptacle containing explosives is deposited.

Special report of deficiencies to be sent.

79. Surveyors should send a special report to the Marine Board in every case in which the Regulation distress signals are not on board the passenger (emigrant) ships and sea-going passenger steamers, which they may be called on to survey.

And they should also, in such cases, decline to grant papers or declarations, unless a written guarantee is given to them that the signals shall be on board, and an opportunity given for inspecting them before the ship sails.

Instructions for rocket apparatus

80. As it is feared that many lives are lost because seamen do not know how to use the rocket lines when fired over their ship from the shore, instructions respecting their management have been prepared on enamelled plates, and will be issued by the Secretary of the Marine Board, free of charge, to the owners or masters of vessels if they undertake to place them on board to the satisfaction of the Surveyors.

The Surveyors should see one of the plates fastened up on the forecabin, or other place where it will be accessible to the petty officers and crew, and the other to where it will be accessible to all the officers.

The plates should be secured by zinc nails, in order to prevent corrosion.

If, upon visiting British vessels, the Surveyors find that the tablets are not prominently exhibited on board, the attention of the owner or master should be drawn to the fact, in order that copies may be supplied.

Fire hose.

81. Passenger steamers going to sea are to be provided with a hose adapted for the purpose of extinguishing fire in any part of the ship, and capable of being connected with the engines of the ship or with the donkey engine, if it can be worked from the main boiler. The Surveyor must take care that it answers the required purpose.

The fire-hoses should be connected, stretched (to judge of their length), and thoroughly examined at every survey, and at least once a year (and at any other time that the Surveyor thinks it necessary) tested with the conductor in its place, by pumping water through them by the main or donkey engines at full speed. A proper conductor and metal bend or goose-neck forms part of its equipment, and must be provided. Generally, leather hoses are the most durable, and should be supplied.

This hose should be connected with steam pumps.

82. All decks and floors upon which passengers are carried which are the main and lower decks only in foreign-going steamers, should be caulked and properly secured. Sufficient light and ventilation should be provided. Scuttles and hatches are not considered as efficient means of ventilation. Proper and sufficient means of ingress and egress should be fitted. Companions or booby hatches should in all cases be fitted to the entrance of or to passenger spaces, and be so arranged as to open and shut easily. Surveyors should satisfy themselves that there are hatches to batten down in bad weather, or that otherwise the booby-hatch is itself so strong, and so securely bolted, as to be part and parcel of the ship, and so fitted that it can be securely closed.

Deck to be caulked and have proper hatches.

83. All coast trade, sea-going passenger steamers should have planked bulwarks of such a height as is, in the Surveyor's judgment, necessary for the proper shelter and protection of passengers, or of such height as is necessary for their safety, and with a weather cloth in addition, to give the required protection. When the height of bulwarks in coast-trade passenger steamers is 4 feet, or on raised quarter deck, 3 feet, no question need be raised, but in all cases the bulwarks should be closed and be of sufficient strength.

Height, &c., of bulwarks.

Accidents and Damages.

84. In all cases in which a steamship has sustained damage from any accident or other cause affecting her seaworthiness or efficiency in any part of her hull, equipments, or machinery the Surveyors of the port where the vessel may be are to go on board and ascertain the extent of the damage. In doing so they will take care not to make any change in the position or condition of things on board which would be at all likely to affect any legal evidence should an inquiry into the case afterwards be considered necessary.

Damage to be inspected.

85. They are forthwith to send a report, together with a rough figured sketch, showing the position of all the bulk-

Report to be sent to the Marine Board.

heads, and distinguishing the compartments that may have been injured, to the Marine Board, in order that the certificate may be cancelled, if necessary. In this report they are to state whether the vessel is rendered inefficient or unseaworthy either in hull or machinery, and whether, in their opinion, the certificate should be cancelled or only temporarily withdrawn. The Surveyors should be very careful that they attend to this important part of their duty.

Lights to be examined.

86. The Surveyor should at the same time examine the lights and screens of the vessel, and if the vessel with which she has been in collision is within his district he should examine the lights of that vessel also, and should forward to the Board, in a separate report, a statement respecting the size, condition, and place of her lamps and screens, and whether, in his opinion, they comply with the requirements of the Regulations, and, if not, in what respects they are deficient.

The Surveyors should be very careful in wording their reports as to lights and screens, as they may be used in evidence in cases taken into court.

Surveyor may order vessel to be docked.

87. If, in consequence of any accident to a steamship, or for any other reason, the Surveyor considers it necessary to require the vessel to be taken into dock for the purpose of surveying the hull thereof, he may do so; but he is to be cautious never to exercise this power unless the circumstances of the case actually require it.

Certificate to be held during repairs.

88. Unless directions to the contrary are given by the Marine Board, the Surveyor is to hold the certificate of the vessel during the time the vessel is under repair; and for this purpose he is to require it of the master, unless the damage is such that in the Surveyor's judgment the certificate should be cancelled, in which case he should forward it to the Board with his report. In all cases of serious damage the certificates should be cancelled.

Should the master or owner decline to give up the certificate, the Surveyor is to send information immediately to the Marine Board, so that if necessary it may be cancelled; but the Surveyor is particularly directed to pay attention to the above instructions respecting reporting the whole case to the Board as soon as possible after it comes to his notice.

Certificate may be indorsed if it has not been cancelled.

89. When the vessel is in every respect rendered seaworthy and efficient, both in hull and machinery, to the entire satisfaction of the Surveyor, he is to put an indorsement on the back of the certificate and duplicate, if they have not previously been cancelled, to the effect that the

damage has been made good so as to last for the period for which the certificate was granted, and return the certificate to the master or owner or his agent, and allow the vessel to proceed. He is then to send to the Marine Board a statement of the extent of the repair that was necessary, and a copy on the indorsement made on the certificate.

90. In all cases in which a Surveyor is directed by the Board to obtain from an owner or master a certificate that has expired, or has been cancelled or revoked, he is to apply for it without delay, and in the event of his application not being attended to, he is at once to report the case. Penalty for not giving up cancelled certificate.

The 24th section of Part I of the Act 35 Vic. No. 7, of 1871, imposes a penalty not exceeding £20 on any person who shall refuse to deliver up such certificate when required to do so by the Marine Board or its Surveyor.

Lights and Fog Signals.

91. The following are the revised instructions issued by the Board to their Surveyors respecting Lights and Fog Signals:— Uniformity in placing lights necessary.

The Surveyors must be very particular in examining the lanterns containing the mast-head light, the coloured side-lights, and the anchor light of steam and sailing vessels, and vessels propelled by electricity or other mechanical power, and in satisfying themselves that in all respects they are in accordance with the regulations, so as to prevent as far as possible any want of uniformity in range, or in the position of the screens and other fittings.

Art. 2. The lights mentioned in the following Articles numbered 3, 4, 5, 6, 7, 8, 9, 10, and 11, and no others, shall be carried in all weathers, from sunset to sunrise:—

Art. 3. A seagoing steamship when under way shall carry—

- (a) On or in front of the foremast, at a height above the hull of not less than 20 feet, and if the breadth of the ship exceeds 29 feet, then at a height above the hull not less than such breadth, a bright white light so constructed as to show an uniform and unbroken light over an arc of the horizon of 20 points of the compass, so fixed as to throw the light 10 points on each side of the ship, viz., from right ahead to 2 points abaft the beam on either side, and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least 5 miles.

- (b) On the starboard side, a green light, so constructed as to show an uniform and unbroken light over an arc of the horizon of 10 points of the compass, so fixed as to throw the light from right ahead to 2 points abaft the beam on the starboard side, and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least 2 miles.
- (c) On the port side, a red light, so constructed as to show an uniform and unbroken light over an arc of the horizon of 10 points of the compass, so fixed as to throw the light from right ahead to 2 points abaft the beam on the port side, and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least 2 miles.
- (d) The said green and red side-lights shall be fitted with inboard screens projecting at least 3 feet forward from the light, so as to prevent these lights from being seen across the bow.

Art. 4. A steamship, when towing another ship, shall, in addition to her side-lights, carry two bright white lights in a vertical line one over the other, not less than 3 feet apart, so as to distinguish her from other steamships. Each of these lights shall be of the same construction and character and shall be carried in the same position, as the white light which other steamships are required to carry.

Art. 5. (a) A ship, whether a steamship or a sailing ship, which from any accident is not under command, shall at night carry, in the same position as the white light which steamships are required to carry; and, if a steamship, in place of that light, three red lights in globular lanterns, each not less than 10 inches in diameter, in a vertical line one over the other, not less than 3 feet apart, and of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least 2 miles; and shall by day carry in a vertical line one over the other, not less than 3 feet apart, in front of but not lower than the foremast head, three black balls or shapes, each 2 feet in diameter.

- (b) A ship, whether a steamship or a sailing ship employed in laying or in picking up a telegraph cable, shall at night carry in the same position as the white light in which steamships are required to carry, and, if a steamship, in place of that light

three lights in globular lanterns, each not less than 10 inches in diameter, in a vertical line one over another, not less than 6 feet apart; the highest and lowest of these lights shall be red, and the middle light shall be white, and they shall be of such a character that the red lights shall be visible at the same distance as the white light. By day she shall carry in a vertical line one over the other, not less than 6 feet apart, in front of but not lower than her foremast head, three shapes, not less than 2 feet in diameter, of which the top and bottom shall be globular in shape and red in colour, and the middle one diamond in shape, and white.

- (c) The ships referred to in this Article, when not making any way through the water, shall not carry the side-lights, but when making way shall carry them.
- (d) The lights and shapes required to be shown by this Article are to be taken by other ships as signals that the ship showing them is not under command, and cannot therefore get out of the way. The signals to be made by ships in distress and requiring assistance are contained in Article 27.

Art. 6. A sailing ship underway, or being towed, shall carry the same lights as are provided by Article 3 for a steamship underway, with the exception of the white light, which she shall never carry.

Art. 7. Whenever, as in the case of small vessels during bad weather, the green and red side-lights cannot be fixed, these lights shall be kept on deck, on their respective sides of the vessel, ready for use; and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side, nor the red light on the star-board side.

To make the use of these portable lights more certain and easy, the lanterns containing them shall each be painted outside with the colour of the light they respectively contain, and shall be provided with proper screens.

Art. 8. A ship, whether a steamship or a sailing ship, when at anchor, shall carry, where it can best be seen, but at a height not exceeding 20 feet above the hull, a white light, in a globular lantern of not less than 8 inches in

diameter, and so constructed as to show a clear, uniform, and unbroken light visible all round the horizon, at a distance of at least 1 mile.

Art. 9. A pilot vessel, when engaged on her station on pilotage duty, shall not carry the lights required for other vessels, but shall carry a white light at the masthead, visible all round the horizon, and shall also exhibit a flare up light or flare-up lights at short intervals, which shall never exceed fifteen minutes.

A pilot vessel, when not engaged on her station on pilotage duty, shall carry lights similar to those of other ships.

Art. 10. Open boats and fishing vessels of less than 20 tons net registered tonnage, when underway and when not having their nets, trawls, dredges, or lines in the water, shall not be obliged to carry the coloured side-lights; but every such boat and vessel shall, in lieu thereof, have ready at hand a lantern with a green glass on the one side, and a red glass on the other side, and on approaching to or being approached by another vessel such lantern shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side nor the red light on the starboard side.

Art. 11. A steamship shall be provided with a steam whistle or other efficient steam sound signal, so placed that the sound may not be intercepted by any obstructions, and with an efficient fog-horn to be sounded by a bellows or other mechanical means, and also with an efficient bell. A sailing ship shall be provided with a similar fog-horn and bell.

In fog, mist, or falling snow, whether by day or night, the signals described in this Article shall be used as follows, that is to say,—

- (a) A steamship underway shall make with her steam whistle, or other steam sound-signal, at intervals of not more than two minutes, a prolonged blast.
- (b) A sailing ship underway shall make with her fog-horn, at intervals of not more than two minutes, when on the starboard tack one blast, when on the port tack two blasts in succession, and when with the wind abaft the beam three blasts in succession.
- (c) A steamship and a sailing ship, when not underway, shall, at intervals of not more than two minutes, ring the bell.

The attention of the Board has frequently been called to the want of uniformity in the range of the lights of sea-going ships, and in the position of the screens and other fittings. Surveyors should therefore be very particular in examining the lanthorns containing the mast-head light, the coloured side-lights, and the anchor light of steam and sailing vessels, and in satisfying themselves that in all respects they are in accordance with the Regulations.

The Regulations are contained in Articles 2 to 20 of the "Regulations for preventing collisions at sea," as contained in the Navigation Act, 35 Vic., No. 7, 1871.

92. The Marine Board attach great importance to the inspection of the lights referred to in the Regulations for preventing collisions at sea, and regard it as one of the most important duties intrusted to the Surveyors. At their request the Board, with a view to the enforcement of the Regulations, have instructed their outdoor officers to at once report to the Surveyors any cases of infringement of the rules which may come under their notice. But the Surveyors themselves should take every opportunity of inspecting the lights of vessels lying within their districts, more especially in cases where they have reason to believe that the Regulations are evaded, either wholly or partially; and whenever they are called upon to survey crew spaces or to do anything on board a ship, they should inspect the lights and fog signals under the Act. Importance of inspection.

Upon visiting a vessel for the purpose of inspecting her lights and fog signals, the Surveyor should first inquire of the master for the certificate of inspection. See para. 4.

If the master produces the certificate in question, the Surveyor should compare the particulars of the lanthorns and screens, and their position as given in that certificate, with the description and position of the lanthorns carried on board. He should also inspect the fog signals on board.

If the Surveyor finds that any particulars, as stated on the certificate, are not in accordance with the state of things on board, he should withdraw the certificate, and when all is in accordance with the Regulations, he should make an indorsement of the fact thereon and return it to the master or owner. A new certificate must not be issued in such a case.

93. In cases in which lights and the means of making fog signals are not fitted and provided in accordance with the Regulations for Preventing Collisions at Sea, the Surveyor making an inspection should be careful to fill up one of the forms supplied for the purpose, specifying the additions or alterations required, and give it or send it by post to the As to detaining ships.

owner, master, or agent. He should point out to owners and masters the necessity of a strict compliance with the Regulations, and he should do all in his power to prevent unnecessary delay or inconvenience. The Surveyor should be careful to use discretion in cases involving the detention of vessels for non-compliance with the Regulations as regards the lights and fog signals. He need not in all cases detain the ship. For instance: (a) When the vessel is not about to leave the jurisdiction. (b) When there is no reason to apprehend delay, or to doubt the good faith of the owner or master in carrying the Regulations, &c., into effect.

If the vessel should afterwards leave the port for another port also within the jurisdiction before the Surveyor is satisfied that the requirements have been complied with he should be careful to communicate with the Secretary to the Marine Board on the subject.

Defects when
made good
certificate to
be given.

94. When the additions or alterations required and notified to the owner have been made, and the Surveyor is satisfied on further inspection that the Regulations are complied with, a form supplied for the purpose should be filled up and sent to the owner or master, and when the expenses (if any) have been paid the Surveyor should send to the collector a certificate under his hand on the proper form, and should fill up and deliver or send to the owner, master, or agent a certificate of inspection, a copy of which should immediately be sent to the Marine Board, and also entered in the office light-book, with the individual surveyors rotation number for light certificates. This rotation number should be entered on the original certificate as well as on the copy sent to the Marine Board.

Regulation
lights only to
be carried.

95. Complaint has been made to the Marine Board that certain sea-going steamships have infringed the Regulations by carrying coloured light signals, used for steering and other purposes, which are not authorised by the Regulations for Preventing Collisions at Sea. The carrying of any lights other than the lights prescribed by the said Regulations is a distinct breach both of the provisions of the Navigation Acts 1871-1896, and of the said Regulations, and will subject the offenders to the penalties and liabilities imposed by the said Act.

Lights and
shapes for
vessels not
under command.

96. The Surveyors should take care to inspect the lights and shapes required to be exhibited by vessels when not under command, and referred to in Article 5 of the Regulations for Preventing Collisions at Sea. If the owners do not provide them, or if they are not sufficient when provided it will, of course, be the duty of the Surveyor to take action as in para. 3.

97. The Surveyors have undoubtedly the right to inspect the lights, &c., of foreign ships within the jurisdiction, and in cases in which any Surveyor has reason to believe or discovers that the lights of a foreign ship are defective, or the screens improperly placed, it is his duty to inspect them, and he should point out to the master or the agents, if on board the vessel, in what respects they are not in accordance with the Regulations, and he should also report full particulars of the case to the Marine Board. The Board will then give such directions as may be considered best. Lights, &c., of
foreign vessels.

Side Lights.

98. The following instructions are not intended to be retrospective so far as lights previously fitted are concerned excepting that the mode of screening hereafter laid down is always to be insisted upon, but Surveyors are desired to use their influence with both owners and lampmakers to induce them to comply with these instructions, especially as regards the colour of the glasses and the vertical divergence of plano-convex and dioptric lenses.

Surveyors can only insist on the lights being of such a character and so fitted as to comply with the Regulations, but the following remarks may assist them in forming their judgment.

99. The width of the back and side of the lantern should Lanterns. not be less than 9 inches, and their height should not be less than 11 inches.

The passages for the admission of air to the interior of the lantern should have ample area, and be so arranged that the flame of the lamp will not be extinguished or caused to smoke by the wind or motion of the vessel in rough weather. The lantern should be constructed in such a manner as to preclude the possibility of spray or broken water obtaining access to its interior in such quantity as to in any way interfere with the efficiency of the light.

The arm or bracket by which the lantern is clamped to the screen should not be less than $\frac{3}{8}$ inch in thickness by 2 inches in breadth; it should be a fairly good fit in the socket of the lantern, and be secured in such a manner that the tightening of the clamping screw will bring the side of the lantern parallel with the side of the screen. The clamping screw should be brass, T-shaped, and not less than $\frac{3}{8}$ inch in diameter. Or else, which is preferable, the lamp should be cleated to the screen top and bottom.

100. The lenses should be made of crown or flint glass, Lenses. highly polished, and free from air-bubbles or other visible

defects. Plano-convex and dioptric lenses should be made as thin as practicable consistently with efficiency and durability.

In order to insure the light being equally visible at all the required angles, it is desirable—

- (1) that the lens should be the arc of a circle, and
- (2) that the radius which describes it should be measured from the centre of the flame, so as to insure the latter being horizontally equidistant from every part of the lens; the length of the radius may be ascertained as follows :—

Measure the chord of any portion of the arc and the versed sine corresponding to that chord, when the following formula will give the length of the radius :—

$$\frac{\frac{a^2}{v} + v}{2} = r.$$

Where a = half the chord.

„ v = the versed sine.

„ r = radius.

The lens should embrace an angle of not less than 120° , and its height must in no case be less than the length of the radius.

The curvature of the outer face of plano-convex lenses and of the respective parts of the outer face of dioptric lenses should be arranged to give the desired concentration of the rays of light, subject to the condition that the light must be visible in a clear atmosphere on a dark night at a distance of at least one sea mile, when the lamp is heeled 20° either above or below the horizontal plane.

In sailing vessels and fishing smacks, from 10° to 15° would be sufficient, but as there is no difficulty in manufacturing lamps which shall have a vertical divergence of 20° and still show the distance required by the Regulations, it is desirable they should all be uniform in this respect.

Lenses coloured throughout absorb and consequently waste much of the light, and even those having a film of colouring matter over the inside face are frequently not as satisfactory as is desirable.

The Surveyors should discourage the use of lenses coloured throughout, and when opportunity offers call attention to the superiority of white lenses with best quality coloured glass slides placed behind them.

When, however, the distinctive colouration is produced in this manner, suitable means should be provided for keeping

the slide in its proper position, and for preventing the door of the lanthorn from being closed when the slide is displaced. A spare set of slides should be provided, and it is desirable in all new lamps that these slides should be set in a metal mounting to prevent breakage.

Several recent cases have been brought to the Board's notice in which the slides were arcs of a circle of the same segment, and no provision had been made to prevent their being interchangeable, the starboard slide, therefore, fitted the port, and the port slide the starboard lanthorn. This arrangement is a source of danger, especially in small coasting vessels, as the wrong glass might inadvertently be placed in the lanthorn. Surveyors, in examining lights, should look carefully to this point, and decline to approve all cases in which they find the slides interchangeable.

101. The colour is a matter of very great importance, and the Marine Board have sent to each district samples of red and green glass, of two different tints. Slides of the same tint as either of these standards or of any intermediate tint may as regards colour be considered satisfactory. Colour

Slides as well as lenses of good colour may, however, be very defective transmitters of light, cases having been found in which their efficiency in this respect has been exceptionally low.

The Surveyors should therefore take frequent opportunities of comparing lights they may have to inspect, with lights which they know comply, as regards colour and visibility, with the Regulations.

In the case of electric side lights, the use of those of higher than 32-candle power should be discouraged, and the shade of green required will probably lie between the darker of the two green tints approved by the Board for oil lamps and the tint corresponding to the sample of glasses furnished by the Board to the Surveyors as suitable for the electric light. With regard to the red light, red slides of the darker of the two standard red tints, or of a shade intermediate between the two standards, will be found to give a very good colour, but in both cases the Surveyor should decide by a practical test. In some instances the glass bulbs of electric lights become blackened, thus seriously reducing the candle power and lessening the range of visibility, and Surveyors should carefully examine all glasses from time to time, and, if necessary, have them renewed.

102. The attention of the Marine Board has been called to the fact that a number of vessels use for side, masthead, and anchor lights, lenses having vertical corrugations or ridges Corrugated lenses.

on their inner surfaces. The effect of these corrugations is to cut up and obstruct the light and to rob the coloured lights of their distinctive colour when seen from certain positions. All these defects are objectionable in the case of lenses of coloured side lights, and such lenses should not be passed. Lenses of unusual pattern, unless already approved, should in all instances be submitted to the Board.

Cistern.

103. The cistern of the lamps should contain sufficient oil to last for at least sixteen hours ; it should not intercept any of the rays that would otherwise fall on the lower half of the lens, and its height should be such that the most luminous part of the flame will be level with the centre of the lens. The centre of the wick, or system of wicks when there are more than one, should coincide with the centre of curvature of the inner face of the lens ; and the base of the lamp should be so arranged, constructed, and fitted in the lanthorn as to render it practically impossible for the lamp to be accidentally or carelessly placed in, or to shift to any position other than that which it would occupy when the foregoing conditions are fulfilled.

When two lamps, one for paraffine and the other for colza, are supplied with a lanthorn, the base plate of the lamps should be alike, and should occupy one and the same part of the lanthorn when the lamps are in their proper position. Lanthorns with means for placing the lamps at different heights should not be passed. The same lamp should not be passed for both paraffine and colza.

Wicks.

104. The wicks of paraffine lamps should not be less than 1 inch, and those of colza lamps not less than $1\frac{3}{4}$ inches, nor more than 2 inches in breadth measured at right angles to the fore-and-aft line of the ship. The wick-holder in the case of 1-inch flat wicks must always be at right angles to the fore-and-aft line of the ship. In the case of wicks of greater breadth than 1 inch, the wick-holder may be placed at any angle desired, so long as the breadth, when measured at right angles to the fore-and-aft line of the ship, is not less than 1 inch nor more than 2 inches. Means should be provided for preventing the wick-holder from being accidentally or carelessly put in, or moved to any other position than that required by this instruction. The same rule should be followed in the case of the filaments of electric lights, the breadth of the filaments being taken as between the extreme edges of their curves.

Circular wicks should be encouraged as much as possible in all oil and paraffine lamps to which they can be suitably adapted.

The wicks of anchor lights should not be less than $1\frac{1}{4}$ inches broad for oil, and $\frac{3}{4}$ inch for paraffine.

The attention of the Marine Board having been called to the use of corduroy for wicks of ship's lights, wicks of that material have been tested and found not to give a light of the character required by the Regulations. The Board have therefore decided to prohibit the use of corduroy for the purpose referred to, and wicks of that material should not in future be passed.

105. When lamps are fitted with glass chimneys, these Glass chimneys. should be of plain white glass of the best quality and form, and there should be at least five spare ones on board for each lamp carried. Coloured chimneys should not be passed for side lights.

106. A substantial metal spherical reflector, silver plated Reflectors. and highly polished, should be fitted to each lamp, its horizontal axis should be in the same plane as the horizontal axis of the lens, the radius which describes the arc should be measured from the centre of the flame, and its length ascertained in the same manner as that of the lens, *i.e.*,

$$\frac{a^2}{v} + v = r.$$

If these instructions are complied with, the centre of curvature of the lens, the centre of curvature of the reflector, and the centre of the flame will be in the same line, both vertically and horizontally.

The reflectors should not be so small that a line drawn from any part of the lens through the centre of the flame should fail to fall on their surface, and they should never be so large as to intercept any of the direct rays falling on the lens.

Means should be provided for preventing the lamp from being placed in the lanthorn with the reflector shipped, but not in its proper position.

It has been brought to the notice of the Marine Board Construction of lamp. that some side lights are constructed in such a manner that the portion of the lamp which extends from the inner side of the lanthorn to the inner side of the lens is of such width as to either partially or wholly cover the wick.

To obviate this, Surveyors should see that the lens is so set in the lanthorn that the rays from the inner edge of the wick may pass through the lens and cut the outer edge of the chock, it being desirable that the setting of the lens should be well clear of this line.

Screens.

107. The screens of side lights, the lengths of which should never be less than 36 inches from the flame to the chock or its equivalent, are always to be placed parallel to the line of keel, and the lights so screened that the forward edge of the screen, or chock on it, shall be in a line parallel to the keel with the inside edge of the wick. In the case of electric lights, there should be a similar screening to the inside edge of the filament. They may be fitted as shown in Plates I and II. The Surveyors should inquire if there be more than one set of side-lights on board, and, if so, should see that the position of the wick-holder is the same in each set, so that the screens as fitted will in each case be suitable. Should there be any difficulty in having this instruction carried out, the case should be at once reported to the Marine Board.

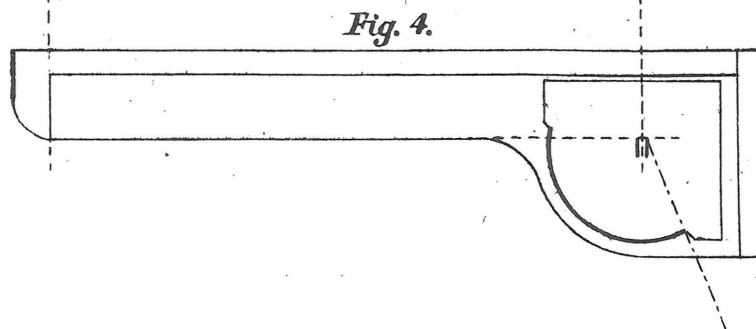
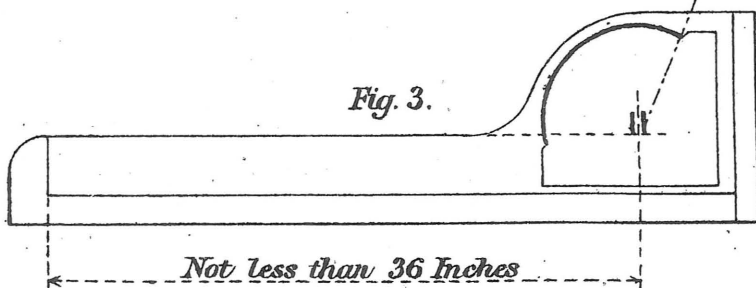
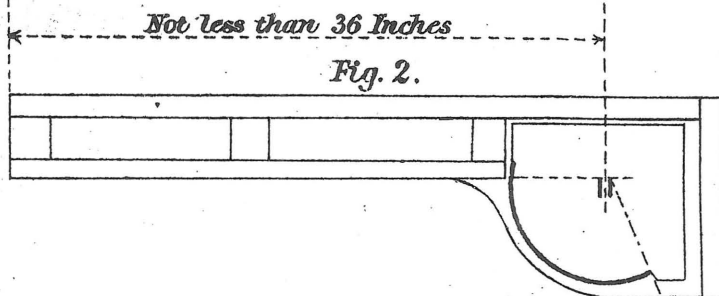
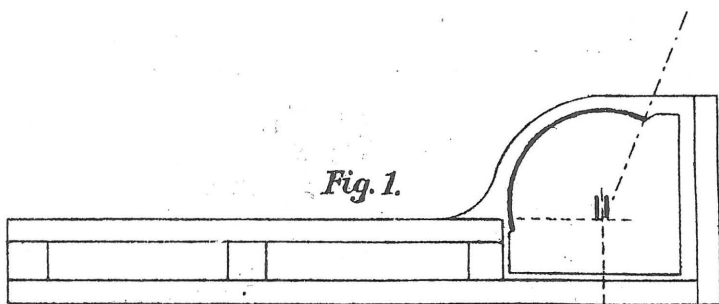
To provide for the full light being visible for two points abaft the beam, the lanthorn should be so constructed that a line drawn from the after edge of the wick in the direction of a bearing of two points abaft the beam shall cut the extreme forward edge of the setting of the lens. Should the wick be placed at right angles to the fore-and aft line of the ship, then the above line should be drawn from the inner edge of the wick (see Plate III).

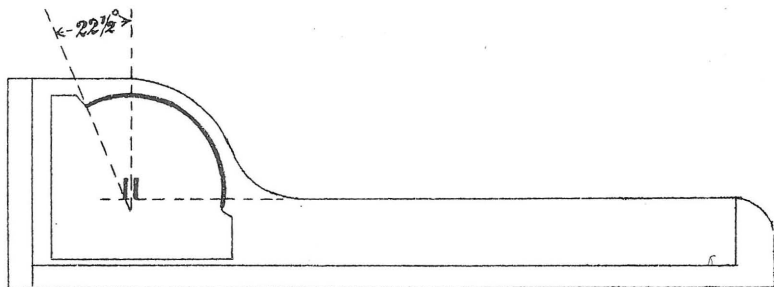
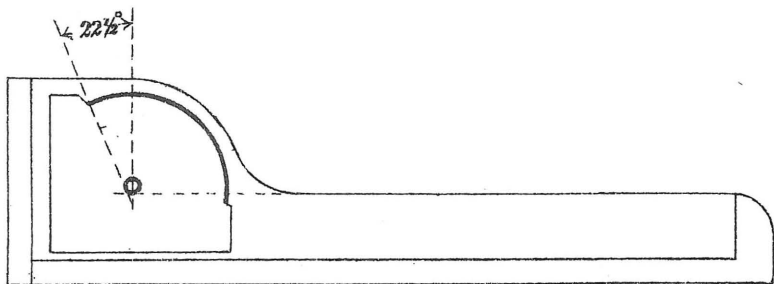
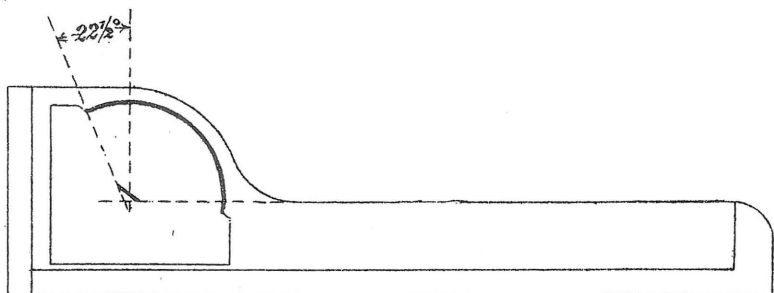
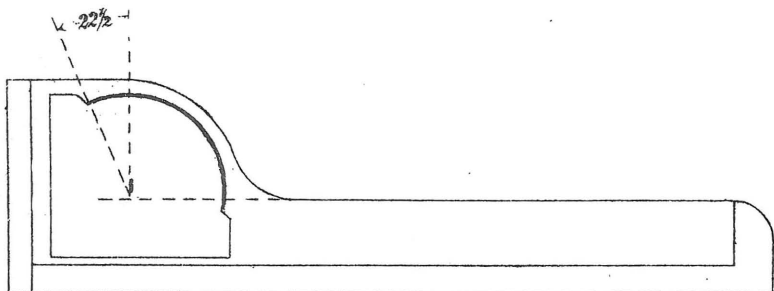
When the screens are of wood, they should be well seasoned, and not less than $1\frac{1}{4}$ inches in thickness; the chock should be at least 2 inches in thickness, and rounded off, as shown in Figs. 1 and 2, Plate I.

The screens are never to be secured to the rigging except in the cases referred to in paragraph 21; when the screens are attached to movable davits or to outriggers extending outwards over the sides of the vessel, they should be fitted with stop pins or distance rods, so contrived and arranged that when the stop pins are in their places the screens will be parallel with the middle line of the vessel.

The davits or stanchions for supporting the screens should in all cases be of a very substantial character and when they go through the top-gallant or main rail they should be carried down into sockets on the covering board or waterway, and have a nut or cotter under the rail to keep them in position.

The screen should be so placed that the lights as screened will not be obscured by any of the fittings of the vessel, such as catheads, boats, boats' davits, sails, rigging, &c., or by passengers or crew moving or standing about forward of the lights. To insure this, the lights should be placed as far forward as practicable, and in vessels of very fine





entrance, where it may not be possible to carry them far forward, great care should be taken that the rays are not thrown so far inboard that persons can intercept them. If the lights are of a sufficient height above the deck to protect them in this respect, no exception need be taken, otherwise either their height should be increased or they should be placed on properly constructed outriggers at the necessary distance outboard of the vessel. If the side lights be mounted in towers, facilities should be provided by means of $1\frac{1}{2}$ inch holes or other apertures in those structures for direct measurement from the wick to a line parallel to the middle line of ship for the purpose of properly adjusting the screens.

108. Light-towers should be carefully noted in the above respect, and in the case of new vessels any requisite alterations should be suggested by the Surveyors before they are too far advanced. They should be as far forward in the ship as may be practicable, and if they will not then comply with the foregoing conditions their height must be increased until they do. Light-towers.

The windows of towers should be made of white glass of the best quality ; they should be of such length and height as to admit of the lights showing in the manner required by the Regulations.

Windows consisting of several panes are undesirable, but may be passed if the mullions are set at an angle of 45° from the vertical and do not exceed $\frac{3}{8}$ inch in width.

In cases, however, where the lamps have more than one wick, the width of the mullions may be somewhat greater, and their angle from the vertical may be decreased.

To enable lights in towers to show the 2 miles required by the Regulations, they will generally require to have greater illuminating power than those carried in the ordinary manner.

If the Surveyors should find tower windows of unusual construction, or such as to lead them to believe that the lights would not be visible at the distance and in the direction required by the Regulations, a test should be made, full particulars of which and of the lights and windows should be submitted to the Board for consideration.

109. When side lights are hung on gimbals, the points of suspension of the latter should be in the same horizontal plane as the centre of the lens, in order that the angle at which the most divergent rays cross each other may be practically constant. Gimbals.

Oscillating
screens.

110. The oscillating screens shown in Plate IV. are considered preferable to gimbals, except for vessels in which the change of fore and aft trim is exceptionally great. When the lamps are carried either by gimbals or oscillating screens the concentration of the lenses may be carried to a greater extent than is thought desirable for fixed lamps.

Lights in the
rigging.

111. When trawlers and other sailing vessels whose gross registered tonnage does not exceed 80 tons cannot with safety and convenience of working carry their side lights on stanchions, they may be carried in the rigging, provided the surveyors are satisfied that they are so fitted as to show the lights for the distance and in the direction required by the Regulations. This is not to be allowed in the case of steamers, and Surveyors are to do their best to insure the side lights of all vessels of 200 tons or over being carried well forward of the midship section of the ship.

Vessels to be
detained unless
lights show
as required by
the Regulations.

112. In the event of the master or owner neglecting or refusing to alter the position of the lanthorns in such a way as to enable them to comply with the Regulations, the Surveyor or Inspector may report the fact to the Secretary of the Marine Board for the purpose of stopping the ship, or otherwise dealing with the case as may be necessary.

Consequences
of altering lights
when Surveyor
has passed them.

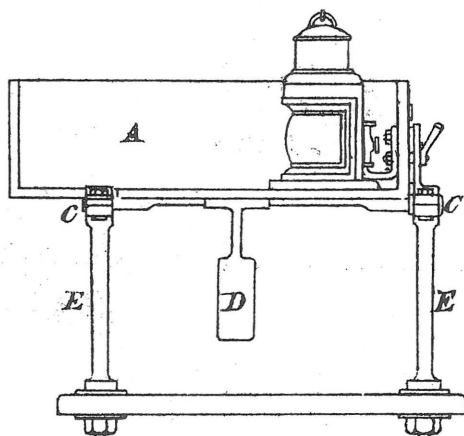
113. If after a vessel has been passed by such Surveyor or Inspector as carrying lanthorns and lights properly constructed and fixed, the master fixes them in such a position that they may be or are obscured so that they are not under all circumstances visible for a distance of 2 miles from right ahead to two points abaft the beam, on the respective sides, as required by Article 3 read in connection with Article 24 of the Regulations, such master will be guilty of a misdemeanor under section 419 of the Merchant Shipping Act.

Mast-head Light.

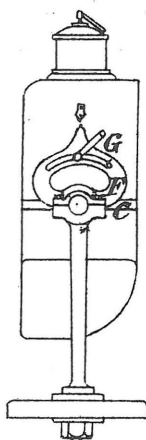
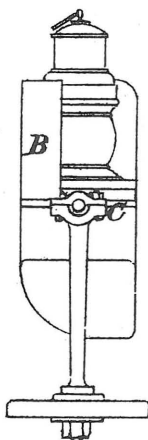
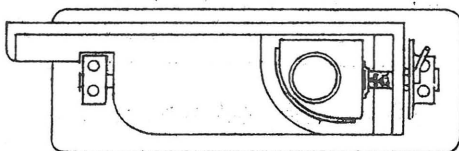
Mast-head light
in steamers.

114. The Surveyors are to be careful to see that every steamer has fittings for the lanthorn for the white light "at the foremast-head," or elsewhere in front of the foremast-head on an independent stay, fitted with a fork and a piece of metal tube running up the stay to carry the fork; and secondly, to see that the light will show for the distance and in the direction required by the Regulations. Surveyors are not to advise owners how to arrange or modify sails, but are to decline declarations if the Regulations are not complied with. The Surveyors are, if they think it necessary, to see the sails set, and are to go aloft to the mast-head in such cases before they give their declarations. Where a

Oscillating Screens.



- A.....Screen.
- C.C. Pivots of screen.
- D.....Balance weight.
- E.E. Stanchions.



- B.....Chock
- C.C. Pivots of screen
- E.....Plate fixed to stanchions
- G.....Screw by which screen may be firmly clamped to plate F at any required angle

Surveyor is from any cause unfit or unable to go aloft himself, he should not give a declaration unless one of his colleagues goes aloft for him and in his presence.

The rules regarding the wicks, wick-holders, and position of the luminous part of the flame of side lights apply equally to mast-head lights.

Electric Lights.

115. The Marine Board are advised that ships' electric side and mast-head lights are not contrary to the International Regulations for Preventing Collisions at Sea, provided they are so constructed, fitted, and arranged as to show for the distances and in the directions and over the arcs required by the Regulations. But in all cases where the electric light is so fitted, it is the duty of the Board's Surveyors to see that oil lamps for use in case of failure of the electric system are also provided and comply with the Regulations.

Electric side
and mast-head
lights.

The power and character of the mast-head electric light should not be such as to give it the character or appearance of a shore light. Too strong a white light may, in the opinion of the Marine Board, often be misleading, and therefore a source of danger to ships seeing it.

The preceding rules, &c., regarding the lenses, reflectors, screens, and screening of ordinary side lights, apply equally to electric lights.

Fog Signals.

116. A fog-bell should be provided in steam and sailing ships. The bell should be hung clear of all obstructions, and should not be less than 8 inches in diameter.

Fog-bell.

117. An efficient steam whistle, at least 8 feet above the deck and situated forward of the funnel, or, if there be more than one funnel, forward of the foremost funnel, should be provided in steamships. The steam whistle should be surveyed by the Surveyor, and care should be taken that it is in such condition as to meet the requirements of the Regulations. It must be above and clear of or in front of any deck-houses, &c., that are likely to obstruct the sound. It is obviously of no use to supply a steam whistle and then to place it behind a house or funnel or ventilator, or behind any erection likely to obstruct the sound.

Steam whistle
and bell, how
to be placed.

A compressed air whistle or an electric bell that can be heard at least a quarter of a mile may be substituted for a steam whistle in launches propelled by electricity and plying in rivers or lakes.

Fog horns.

118. A proper *mechanical* fog horn, of good power, should be provided in both steam and sailing vessels. The fog horn may be such that it can be blown by steam from a donkey boiler, or from the main boiler, or it may be a horn that can be blown by hand. The fog horn should be of some approved pattern known to emit great and penetrating sound. It should always be tried.

If a fog horn is fitted to be blown by steam it must be supplemented by another to be blown by hand, unless it is possible that the steam fog horn can be used also by hand.

Whenever emigration surveys, or surveys for passenger certificates are made, the Surveyors should be particularly careful to look to the efficiency of the fog horns.

Fishing Vessels.

Fishing vessels.

119. The Surveyors should, so far as their other duties will permit, see that the Regulations relating to lights, fog signals, and marking are complied with in the case of fishing vessels, as there is reason to believe that in vessels of this description the requirements of the law are often disregarded.

Sailing trawlers' lights.

120. The Regulations at present in force as regards the lights to be carried by sailing trawlers are as follows, viz.:—

- (a) When under way and their trawls are *not* in the water, they are to carry the same lights as other sailing vessels.
- (b) When under way with their trawls in the water, they must carry the lights named below; that is to say—
 1. The ordinary side lights as for other sailing vessels; or
 2. Two vertical lights, viz., a green and red duplex lanthorn above an all-round white light; or
 3. An all-round white light, with a sufficient supply of red pyrotechnic flares to be shown on approaching or being approached by another vessel.

Under the Regulations any sailing trawler, whether above or below 20 tons register, can carry a fixed all-round white light, supplemented by red pyrotechnic flares.

It is to be understood quite distinctly that in addition to the lights to be shown when the trawl is in the water, the lights required to be shown when the trawl is *not* in the water are to be on board and inspected by the Surveyor.

Unseaworthy Ships.

121. Every registered owner of a British ship, and the agent of such owner, who sends or attempts to send, or is party to the sending or attempting to send, such ship to sea from any port or place in New South Wales in so unseaworthy a state that the life of any person is likely to be thereby endangered, shall be guilty of a misdemeanour; but the provisions of this section shall be subject to the following exceptions, and in all proceedings under this or the next following section the Court shall give effect to and be governed by the following rules:—

Owner, &c.,
sending unseaworthy ship to sea guilty of a misdemeanour
39 & 40 Vic., c.
80, s. 4.

- (1.) It shall not be an offence under this section to send any ship to sea under tow of a steam-tug or steamship for the purpose of taking such ship to some port or place for the express purpose of being refitted, repaired, docked, or beached.
- (2.) It shall not be an offence under this section to send or attempt to send, or to be party to sending, a ship to sea being in an unseaworthy state as aforesaid, when the taking of such ship to sea by the master would be within the saving provided by the third section hereof.
- (3.) If the defendant prove that the business of loading, ballasting, or keeping such ship in proper order, whether as to hull, machinery, tackle gear, or other equipment whatsoever, had been entrusted to any managing owner, director, ship's husband, or other person, and if the defendant also prove that he was not privy or party to the particular act or condition alleged as the cause of unseaworthiness, he shall be entitled to an acquittal.
- (4.) Where an agent, or other person acting under a general or particular authority from any such owner, or from any such managing owner or director, shall load, or cause, or permit to be loaded or ballasted, or be privy to the loading or ballasting of any such ship, in such a manner as to render her unfit to proceed to sea with safety, such agent and every such owner and director shall be jointly and severally liable under this section, but shall be entitled to an acquittal if he prove that the act of such agent or other person was in violation of any general or special direction in writing, given by him or by any of his co-owners to such agent or person, and that he had no knowledge of the act of such agent or person before the ship so loaded or ballasted proceeded to sea.

- (5.) It shall not be necessary in any prosecution under this section to prove that the defendant gave an express direction to take the ship to sea, or committed or attempted to commit some act for the purpose of sending the ship to sea ; but the Court shall presume the acquiescence of any such owner or agent as aforesaid in the sending or taking of the ship to sea to be equivalent to an actual sending or taking her to sea by the defendant.
- (6.) Every ship loaded so as to immerse when in port the horizontal line of the disc painted or delineated as hereinafter provided, shall, whilst so loaded, be deemed to be unseaworthy and unfit to proceed to sea.
- (7.) The defendant may give evidence in the same way as any other witness on his own behalf for the purpose of proving any matter permitted by this or the next following section.

Master taking
unseaworthy
ship to sea.
39 & 40 Vic., c.
80, s. 4.

122. Every master of a British ship who knowingly takes such ship to sea from any port or place in New South Wales in so unseaworthy a state that the life of any person is likely to be thereby endangered, shall be guilty of a misdemeanour, unless he proves that he took such ship to sea under circumstances declared by sub-section 1 of the next preceding section hereof not to constitute an offence under that section, or unless he proves that the taking of such ship to sea was necessary in order to prevent her from going ashore, or that it was impossible to put the ship in a seaworthy state at such port or place, and that the crew consented to his putting to sea for the purpose of refitting, repairing, docking, or beaching such ship at some suitable port or place.

Punishment.

123. Any person convicted of a misdemeanour under either of the last preceding sections shall be liable to such fine, not exceeding £1,000, as the Court may award, or to be imprisoned with or without hard labour for any term not exceeding three years, or (if the Court shall think fit) to be fined and imprisoned within the aforesaid limits.

Obligation of
shipowner to
crew as to sea-
worthiness of
ships.

124. In every contract of service, expressed or implied, between the owner of a ship and the master or any seaman thereof, and in every instrument of apprenticeship whereby any person is bound to serve as an apprentice on board any ship, there shall be implied, notwithstanding any agreement to the contrary, an obligation on the owner of the ship that

he and the master and every agent charged with loading such ship or fitting or ballasting her or preparing her for or sending her to sea shall use all reasonable means to ensure the seaworthiness of the ship for the voyage at the time when the voyage commences, and to keep her in a seaworthy condition during the voyage.

125. Where a British ship being in any port or place in New South Wales is by reason of the defective condition of her hull, equipment, or machinery or by reason of over-loading or improper loading or ballasting unfit to proceed to sea without serious danger to human life, having regard to the nature of the service for which she is intended, any such ship (hereinafter referred to as "unsafe") may be provisionally detained for the purpose of being surveyed and either finally detained or released as follows :—

Power to detain unsafe ships and procedure for such detention.

- (1.) If the Marine or a Local Marine Board, or where there is no such Board a Police Magistrate, has reason to believe on complaint or otherwise that a British ship is unsafe, such Board or Magistrate may provisionally order the detention of the ship for the purpose of being surveyed.
- (2.) When a ship has been provisionally detained there shall be forthwith served on the master of such ship a written statement of the grounds of her detention, and the Marine or a Local Marine Board may, if they think fit, appoint some competent person or persons to survey the ship and report thereon to the Board.
- (3.) Such Board on receiving the said report may either order the ship to be realised, or if in their opinion the ship is unsafe may order her to be finally detained either absolutely or until the performance of such conditions with respect to the execution of repairs or alterations or the unloading or reloading of cargo or the proper ballasting of such ship as the Board think necessary to ensure her safety for sea-going purposes, and may from time to time vary or add to any such order.
- (4.) Before the order for final detention is made a copy of the report shall be served upon the master of the ship, and within seven days after such service the owner or master of the ship or the owner's agent may appeal to the Governor in Council against such order for final detention.

- (5.) Where the ship has been provisionally detained the owner or master of the ship at any time before the person appointed under this section to survey the ship makes such survey, may require that he shall be accompanied by such certificated Marine Surveyor as the owner or master may select, and in such case if the Surveyors agree the Board or Local Marine Board shall cause the ship to be detained or released accordingly ; but if they differ such Board may act as if the requisition had not been made, and the owner and master shall have the like appeal touching the report of the official surveyor as hereinbefore provided.
- (6.) The Marine or Local Marine Board may at any time, if satisfied that a ship detained under this Act is not unsafe, order her to be released either with or without conditions.

Liability of the Government for wrongful detention in certain cases.

126. If any ship shall be detained wrongfully and without reasonable and profitable cause under the powers conferred by the sixth section of this Act, the owner of such ship may bring an action for compensation against the Government for loss or damage sustained by him in consequence of such detention, including the cost of or incidental to the detention and survey of the ship. In such action the Colonial Treasurer shall be the nominal defendant, and the action shall be tried before the Chief Justice of the Supreme Court or a Deputy-Judge appointed by him sitting as in Vice-Admiralty, in accordance with the provisions contained in the Acts and Rules in force for the time being regulating the practice of the Vice-Admiralty Court, and subject to the same right of appeal from the Order or Decree of the Court as is by law incident to the jurisdiction of Vice-Admiralty. All damages and costs of suits adjudged against such nominal defendant shall be paid pursuant to the provisions of the sixth and seventh sections of the "Claims against the Colonial Government Act."

Ship may be detained on affidavit that she is unsafe.

127. Where a joint or several affidavit or statutory declaration by at least one-fourth of the crew of a foreign-going ship or by at least two of the crew of a coast trade-ship (which affidavit or declaration the President of the Marine Board Chairman of a Local Marine Board or in the absence of such officer the Vice-President or Vice-Chairman of such Board or a Police Magistrate where there is no such Board is hereby authorised to take and for that purpose to administer an oath or take a solemn declaration as the case may be) is made to the Marine or Local Marine Board or to a

Police Magistrate that a British ship is unsafe, the Board or Magistrate shall take all proper and reasonable measures for ascertaining whether the ship ought to be detained under this Act or not.

128. If any person shall in such affidavit or declaration as aforesaid knowingly make a false statement as to the state of the hull, machinery, or equipment of any ship, or as to any other matter relating to such ship or to her cargo, loading, or ballasting for the purpose of procuring her detention under this Act, such person shall be guilty of a misdemeanour and be liable to the like punishment as is provided by section four of this Act for the misdemeanour of sending or taking to sea an unseaworthy ship.

Punishment for making false statement in affidavit or declaration.

129. (1) An officer authorised by the Marine or Local Marine Board to act as a detaining officer under this Act shall have for the purpose of carrying out his duties under this Act the same powers as an Inspector under the Principal Act.
- (2) An order for the detention of a ship provisional or final, and an order varying the same shall be served as soon as may be on the master of the ship.
- (3) When a ship has been detained under this Act she shall not be released by reason of her register being subsequently closed or transferred.
- (4) For the purposes of a survey under this Act any person authorised to make the same may go on board a ship and inspect the same and every part thereof, and the machinery, equipments, and cargo, and may require the unloading or removal of any cargo, ballast, or tackle.
- (5) The provisions of the Principal Act with respect to persons who wilfully impede an Inspector or disobey a requisition or order of an Inspector shall apply to officers authorised to detain, inspect, or survey a ship as if those provisions were herein enacted.

Supplemental provisions as to detention of ship
Ib. s. 12.

Grain Cargoes.

130. No cargo of which more than one-third consists of wheat, maize, oats, barley, or any other kind of grain hereinafter referred to as grain cargo shall be loaded on board any ship in any port or place in New South Wales unless such grain cargo be contained in bags, sacks, or barrels, or secured from shifting by boards, bulkheads, or otherwise. If the managing owner or master, or the agent of such owner who is charged with the loading of such ship or the sending her

Stowage of cargo of grain, &c.
Ib. s. 25.

to sea knowingly allows any grain cargo or part of a grain cargo to be shipped therein for carriage contrary to the provisions of this section he shall for every such offence incur a penalty not exceeding £100.

Deck and Load-lines.

Marking of deck
lines.
Ib. s. 25.

131. Every British ship (not being under 20 tons register and employed solely in the coasting trade or employed solely in fishing or a pleasure yacht) shall be permanently and conspicuously marked with lines of not less than 12 inches in length and 1 inch in breadth painted longitudinally on each side amidships or as near thereto as is practicable, and indicating the position of each deck which is above water. The upper edge of each of these lines shall be level with the upper side of the deck plank next the waterway at the place of marking. The lines shall be white or yellow on a dark ground or black on a light ground.

Marking of load-
line on foreign-
going British
ships.
Ib. s. 26.

132. With respect to the marking of a load-line on British ships, the following provisions shall have effect:—

- (1) The owner of every British ship (not being within the exceptions mentioned in the last preceding section) shall before entering his ship outwards from any port or place in New South Wales upon any voyage for which he is required so to enter her or (if that is not practicable) as soon after as may be mark upon each of her sides amidships or as near thereto as is practicable in white or yellow on a dark ground or in black on a light ground a circular disc 12 inches in diameter with a horizontal line 18 inches in length drawn through its centre.
- (2) The centre of such disc shall indicate the maximum load-line in salt water to which the owner intends to load the ship for that voyage.
- (3) He shall also upon so entering her insert in the form of entry delivered to the Collector or other principal officer of Customs a statement in writing of the distance in feet and inches between the centre of this disc and the upper edge of each of the lines indicating the position of the ship's decks which is above that centre.
- (4) If default is made in delivering this statement any officer of Customs may refuse to enter the ship outwards.

- (5) The master of the ship shall enter a copy of this statement in the agreement with the crew before it is signed by any member of the crew, and no Shipping Master shall proceed with the engagement of the crew until this entry is made.
- (6) The master of the ship shall also enter a copy of this statement in the official log-book.
- (7) When a ship has been marked as by this section required she shall be kept so marked until her next return to a port of discharge in New South Wales.

133. With respect to the marking of a load-line on British coast-trade ships, the following provisions shall have effect :—

Marking of load-line in case of coast-trade ships.
lb. s. 27.

- (1) The owner of every coast-trade ship over 20 tons register shall before proceeding to sea from any port mark upon each of her sides amidships, or as near thereto as is practicable, in white or yellow on a dark ground or in black on a light ground a circular disc 12 inches in diameter with a horizontal line 18 inches in length drawn through its centre.
- (2) The centre of this disc shall indicate the maximum load-line in salt water to which the owner intends to load the ship until notice is given of an alteration.
- (3) He shall also once in every twelve months immediately before the ship proceeds to sea send or deliver to the Collector or other principal officer of Customs of the port of registry of the ship a statement in writing of the distance in feet and inches between the centre of the disc and the upper edge of each of the lines indicating the position of the ship's decks which is above that centre.
- (4) The owner before the ship proceeds to sea after any renewal or alteration of the disc shall send or deliver to the Collector or other principal officer of Customs of the port of registry of the ship notice in writing of such renewal or alteration, together with such statement in writing as before-mentioned of the distance between the centre of the disc and the upper edge of each of the deck-lines.
- (5) If default is made in sending or delivering any notice or statement required by this section to be sent or delivered the owner shall be liable to a penalty not exceeding £100.
- (6) When a ship has been marked as by this section required she shall be kept so marked until notice is given of an alteration.

Penalty for
offences in
relation to marks
on ships.
Ib. s. 28.

134. An owner or master of a British ship who neglects to cause his ship to be marked as by this Act required, or to keep her so marked, or who allows such ship to be so loaded as to immerse in salt water the centre of the disc, and any person who conceals, removes, alters, defaces, or obliterates or suffers any person under his control to conceal, remove, alter, deface, or obliterate any of the said marks except in the event of the particulars thereby denoted being lawfully altered shall for each offence incur a penalty not exceeding £100. If any of the marks required by this Act is in any respect inaccurate so as to be likely to mislead, the owner of the ship shall incur a penalty not exceeding £100.

Load-line to be
altered if Board
so direct.

135. If upon the report of any duly authorised officer the Marine or Local Marine Board shall after inspection of any foreign-going or coast-trade ship registered in the Colony be of opinion that the load-line as marked under the thirteenth or fourteenth sections of this Act on the sides of such ship is placed too near the line of the ship's deck, and that the hull of such ship could not be immersed as far as such load-line to ensure her safety at sea, such Board shall be empowered to give notice to the owner or master of such ship calling upon him to alter the position of such load-line as by such notice is directed, or to show cause before the Board why the same shall not be so altered as directed; and if within fourteen days after the service of such notice such load-line shall not be so altered such owner or master shall (unless he shall have shown cause to the satisfaction of the Board against the alteration of the load-line) incur a penalty not exceeding £100.

Enforcing deten-
tion of ship.
Ib. s. 34.

136. Where under this Act a ship is authorised or ordered to be detained any commissioned officer on full pay in the naval or military service of Her Majesty, or any officer of the Marine or a Local Marine Board or of the Customs or any officer of the Police Force may detain the ship, and if the ship after such detention or after service on the master of any notice of or order for such detention proceeds to sea without having been duly released, the master of the ship shall be guilty of a misdemeanour and shall be liable to the like punishment provided in section four, and the owner and any person who sends the ship to sea if such owner or person be party or privy to the offence shall incur a penalty not exceeding £100. Where a ship so proceeding to sea takes to sea when on board thereof in the execution of his duty any officer authorised to detain the ship or other officer as aforesaid the owner and master of the ship shall each be liable to pay all expenses of and incidental to such officer

being so taken to sea, and also a penalty not exceeding £100 or (at the option of the prosecutor) not exceeding £10 for every day until such officer returns or until such time as would enable him after leaving the ship to return to the port from which he is taken, and such expenses may be recovered in like manner as the penalty.

137. Where any order, notice, statement, or document requires for the purpose of any provision of this Act to be served on the master of a ship the same shall be served where there is no master, and the ship is in the jurisdiction of the Marine Board, on the managing owner of the ship, or if there is no managing owner on some agent of the owner residing in New South Wales, or where no such agent is known or can be found by affixing a copy thereof to the mast of the ship. Any such order, notice, statement, or document may be served by delivering a copy thereof personally to the person to be served or by leaving the same at his last place of abode, or in the case of a master by leaving it for him on board the ship with the person being or appearing to be in command or charge of such ship. Any person who obstructs the service of any order, notice, statement, or document on the master of a ship shall incur a penalty not exceeding £10, and if the owner or master of the ship is party or privy to such obstruction he shall be guilty of a misdemeanour.

Service of order
on master, &c.
Ib. s. 35.

138. The name and address of the managing owner for the time being of every British ship registered at any port or place in New South Wales shall be registered at the Custom-house of the ship's port of registry. Where there is not a managing owner there shall be so registered the name of the ship's husband or other person to whom the management of the ship is entrusted by or on behalf of the owner, and any person whose name is so registered shall for the purposes of the "Navigation Acts of 1871-1881" be under the same obligations and subject to the same liabilities as if he were the managing owner. If default is made in complying with this section the owner shall be liable, or if there be more owners than one each owner shall be liable in proportion to his interest in the ship to a penalty not exceeding in the whole £100 each time the ship leaves any port in New South Wales.

Ship's managing
owner or
manager to be
registered.
Ib. s. 36.

Overloading Foreign Ships.

139. Where a foreign ship being in any port in New South Wales is unsafe by reason of overloading, improper loading, or ballasting the provisions of this Act with respect to the detention of ships shall apply to such ship

Application to
foreign ships of
provisions as to
detention.
Ib. s. 13.

as if she were a British ship, but with the following modifications:—

- (1.) A copy of the order for the provisional detention of the ship shall be forthwith served on the Consular Officer for the State to which the ship belongs at or nearest to the place where the ship is detained.
- (2.) Where a ship has been provisionally detained the Consular Officer on the request of the owner or master of the ship may require that the person authorised to survey the ship shall be accompanied by such person as the Consular Officer may select, and in such case if the Surveyor and such person agree the Marine or Local Marine Board shall cause the ship to be detained or released accordingly, but if they differ such Board may act as if the requisition had not been made, and the owner and master shall have the same right of appeal to the Governor in Council as is hereinbefore provided by this Act with respect to the detention of British ships.

In this section the expression "Consular Officer" means any Consul-General, Vice-Consul, Consular Agent, or other Officer recognised by the Governor as a Consular Officer of a foreign State.

Rules and Regulations for fixing the Load Water-line of all Foreign and Coast-trade Ships.

140. Under and by virtue of the powers conferred upon us by the Navigation Acts, 1871–1881, we, the Marine Board of New South Wales, make the following Rules and Regulations for fixing the Load Water-line of all Foreign and Coast-trade Ships—that is to say, we hereby order and direct that—

In the following Tables the word Freeboard denotes the height of the side of a ship above the water-line at the middle of her length, measured from the top of the deck at the side, or, in cases where a waterway is fitted, from the curved line of the top of the deck continued through to the side. The freeboards and the corresponding percentages of reserve buoyancy necessary for flush-deck steamers not having spar or awning decks, for awning-deck steamers, and for flush-deck sailing vessels, are given in Tables A, C, and D for vessels of these classes and of various dimensions and proportions. The freeboards necessary for spar-deck steamers are given in Tables B. The latter are determined by considerations of structural strength, and they denote the limitations to depth of loading which are thereby imposed upon first-class vessels of this type. The freeboards and percentages of reserve buoyancy thus obtained being in excess of what would otherwise be required, the amounts of such percentages are not given in Tables B.

The exact freeboard required for a given ship belonging to any of the classes comprised in Tables A, C, and D may be calculated by constructing a displacement scale to the height of the deck to which the freeboard is measured, so as to give the whole external volume up to the upper surface of that deck. The percentage of the total volume which is given in the tables as the reserve buoyancy for a vessel of given type and dimensions will be the amount of volume that must be left out of the water. If a water-line be drawn upon the displacement scale aforesaid to cut off the given percentage of total volume, the height of side above this line will be the freeboard required.

In order to simplify and reduce the work that would be involved by the above mode of determining the water-line and the consequent freeboard, that correspond to a given percentage of reserve buoyancy, an approximate method is adopted in the following tables, which enables the freeboard of a vessel to be calculated with a sufficient degree of accuracy for all ordinary working purposes. The use of this method not only saves the time and labour that would be involved by making a complete displacement

scale for the whole external volume of a ship, but, what is much more important, it makes the Tables easily and directly applicable in cases where such a displacement scale for a vessel is not at hand, or where the data requisite for constructing one are not procurable.

In this approximate method the form of the ship is taken into account by means of proportionate quantities, which are termed coefficients of fineness, instead of by the exact volumes that a displacement scale would give. It is found that the whole internal volume of a ship as measured for register tonnage divided by the product of the length, breadth, and depth, measured as described in the following clauses 1, 2, and 3, gives a fractional quantity or coefficient which bears a nearly constant relation to the quantity that would be obtained by dividing the whole external volume below the upper surface of the deck by the product of the length, breadth, and depth. This fractional quantity is called the "coefficient of fineness" for freeboard purposes; and it serves the same practical object, when combined with the dimensions of the ship in the manner explained in the tables, as the volume itself would do.

In applying such an approximate method as the above, it is necessary to connect the coefficients of fineness given in the Tables with a standard sheer and round of beam. The standard scales for sheer and round of beam that have been adapted for this purpose are given in clauses 16 and 17 hereafter. Descriptions are also there given of the corrections that should be made for deviations from these standard amounts.

The freeboards given in the Tables are for flush deck vessels in all cases. Such reductions in freeboard as may be allowed for deck-erections of various kinds and sizes in steamers not having spar or awning decks, and in sailing vessels, are described in paragraphs 11, 12, 13, 14, and 15.

No reduction of freeboard should be allowed on account of deck-erections in spar-deck and awning-deck steamers.

Tables A and D give the minimum freeboards for first-class iron and steel vessels, the strength of which is at least equal to the requirements of the 100A class in Lloyd's Register for three-deck and smaller vessels. The freeboard of all other iron and steel vessels, classed or unclassed, should be regulated by the same standard; the increase of freeboard required in each case being determined by the limit at which the stress per square inch upon the material of the hull amidships shall not exceed that of the standard class, of the same proportions, form, and moulded depth, when loaded to the freeboards required by Tables A and D. Tables B and C give the freeboards for vessels built in accordance with, or equal to the requirements of Lloyd's Register for the spar and

awning deck classes ; and are subject to the conditions just stated for any modifications of strength in excess or diminution of the requirements of their respective classes.

1. *Length*.—The length of the vessel is measured on the load-line from the foreside of the stem to the aft side of the stern-post in sailing vessels, and to the aft side of the after-post in steamers.

2. *Breadth*.—The breadth used in obtaining the coefficient of fineness is the extreme breadth measured to the outside of plank or plating as given in the Register Book, or on the Certificate of the Ship's Registry.

3. *Depth of Hold*.—The depth used in obtaining the coefficient of fineness is the depth of hold as given in the Register Book, or on the Certificate of the Ship's Registry. This dimension is subject to modification in determining the coefficient of fineness, as explained in clause 4.

4. *Coefficient of Fineness*.—The coefficient of fineness in one, two, and three deck and spar-deck vessels is found by dividing 100 times the gross registered tonnage of the vessel below the upper deck by the product of the length, breadth, and depth of hold. In awning-deck vessels the registered depth and tonnage are taken below the main deck.

(a) It is of importance in the application of the rules and tables of freeboard that the coefficient of fineness deduced from the under-deck tonnage, and the principal dimensions, should be a correct index to the vessel's relative fulness of form, and that a change in any of those elements which affect the coefficient, determined in accordance with the rules set forth should be considered, and the necessary correction, having regard to the special circumstances of the case, introduced. Among the cases that have from time to time come under notice are the following :—

(b) *Vessel having a cellular bottom throughout, or floors of greater depth than those usually fitted*.—In such a case the coefficient as determined from the under-deck tonnage is in most instances slightly greater than it would be if the vessel were framed on the ordinary transverse system with floors of the usual depth. No general rule can be given for guidance, but it is not difficult, if the depth and slope of the top of the cellular bottom or floor be compared on the midship section with the depth and slope of an ordinary floor, to determine very closely the amount of the correction necessary.

- (c) *Vessel constructed with floors of the ordinary kind, but with a cellular bottom for a part of the length amidships under the engines and boilers.*—In such a case the registered under-deck tonnage is smaller than it would be if the vessel were framed with ordinary floors throughout, the difference being the tonnage of the space between the top of the cellular bottom in the part amidships and the level of the ordinary floor. The depth of hold is also measured by the Customs officials to the top of the cellular bottom, and this depth is inserted in the register. Under such circumstances, in order to arrive at the coefficient of fineness, the vessel would have, if built on the ordinary system throughout, and for which the tables are framed, the tonnage of the volume between the top of the cellular bottom and the level of the ordinary floor should be calculated and added to the registered under-deck tonnage. The tonnage so corrected, used in conjunction with the depth of hold to the top of the ordinary floor, gives the coefficient to be used in the Tables.
- (d) *Vessel constructed with a cellular bottom throughout the fore and aft holds, but with floors of the ordinary kind fitted for a part of the length amidships under the engines and boilers.*—In such a case the tonnage of the space between the top of the ordinary floors in the part amidships, and the top of the cellular bottom, if made continuous, should be estimated, and deducted from the registered under-deck tonnage, and the remainder employed in conjunction with the depth of hold to the top of the cellular bottom in determining the coefficient of fineness.
- (e) Other cases may in practice arise in which the registered under-deck tonnage, or the registered depth of hold, or both require modification before being used in the determination of the coefficient of fineness, but little difficulty will be experienced in making the necessary correction, if it be remembered that the coefficient sought is the coefficient the vessel would have if framed on the ordinary transverse system.

5. *Moulded Depth.*—The moulded depth of an iron or steel vessel, as given in the Tables, is the perpendicular depth taken from the top of the upper deck beam at side, at the middle of the length of the vessel, to the top of the keel and the bottom of the frame at the middle line, except in spar and awning deck vessels, in which the depth is measured from the top of the *main* deck beams. In wooden and composite vessels the moulded depth is

taken to be the perpendicular depth from the top of the upper deck beam at the side of the vessel amidships to the lower edge of the rabbet of the keel.

- (a) The form at the lower part of the midship transverse section of many wooden and composite vessels being of a hollow character, as in cases where thick garboard strakes are fitted, the moulded depth in such instances should be measured from the point where the line of the flat of the bottom continued cuts the keel.

6. *Freeboard*.—The moulded depth, taken as above described, is that used in the Tables for ascertaining the amount of reserve buoyancy and corresponding freeboard in vessels having a wood deck, and the freeboard is measured from the top of the wood deck at side, at the middle of the length of the vessel.

- (a) On the same principle, in *flush-deck* vessels, other than spar or awning decked, and in vessels fitted with short poop and forecastle, having an iron upper deck, not covered with wood, the usual thickness of a wood deck should be deducted from the moulded depth of the vessel measured as above, and the amount of reserve buoyancy and corresponding freeboard taken from the column in the Tables corresponding with this diminished moulded depth. *Example*: In a steamer fitted with an iron upper deck, not covered with wood, and having a moulded depth of 19 ft. 10 in., 4 in., or the usual thickness of a wood deck, must be deducted from this, leaving a depth of 19 ft. 6 in. The freeboard of such a vessel with a coefficient of fineness of 0.76, taken from the column under 19 ft. 6 in., is 3 ft. 8½ in., which should be measured from the top of the iron upper deck.

- (b) In spar-deck vessels having iron spar decks, and in awning-deck vessels having iron main decks, the freeboard required by the Tables should be measured as if those decks were wood covered. Also in vessels where $\frac{7}{10}$ ths, or more, of the main deck is covered by substantial erections, the freeboard found from the Tables should be measured amidships from a wood deck, whether the deck be of wood or iron. In applying this principle to vessels having shorter lengths of substantial enclosed erections the reduction in freeboard, in consideration of its being measured from the iron deck, is to be regulated in proportion to the length of the deck covered by such erections. Thus in a vessel having erections covering $\frac{5}{10}$ ths of the length, the reduction is $\frac{5}{10}$ ths of 3½ inches, or 2 inches.

7. For vessels which trim very much by the stern, through the engines being fitted aft, the freeboard, as ascertained from the Tables, if set off amidships would not cut off the amount of surplus buoyancy deemed necessary, and in such cases the suitable freeboard amidships could only be determined after full information is obtained regarding the vessel's trim.

8. The following example will illustrate the *general* application of the Tables :—

In a steamer of the following dimensions, viz., length, 204 ft.; breadth extreme, 29 ft.; depth of hold, 16·0 ft.; registered tonnage under deck, 682 tons; and *moulded* depth, 17·0 ft., the under deck capacity in cubic feet is 68,200; by dividing this by 94,656, that is, the product of the length, breadth, and depth of hold, the quotient is 0·72, or the coefficient of fineness.

If we now refer to Table A at 17·0 ft. moulded depth, and trace the line opposite the coefficient 0·72 to the column corresponding with this depth, it is found that the winter freeboard given for a *first-class steam vessel without erection*, whose length is twelve times the moulded depth, is 2 ft. 11 in., corresponding with a reserve buoyancy of 25 per cent. of the total bulk.

9. *Vessels of Extreme Proportions.*—For vessels whose length is greater or less than that of the vessel of the same moulded depth for which the Tables are framed, the freeboard should be increased or diminished as specified in the footnote to the Tables. Thus, if the vessel in the example clause 8 were 224 ft. long, the winter freeboard required would be 2 ft. 11 in. plus 2 in., or 3 ft. 1 in. For steam vessels with top-gallant forecastles, having long poops or raised quarter-decks connected with bridge-houses, the whole extending over $\frac{1}{10}$ ths, or more, of the length of the vessel, the correction for length should be one-half that specified in Tables A.

10. *Breadth and Depth.*—In framing the Tables it has been assumed that the relation between the breadth and depth is such as to ensure safety at sea with the freeboard assigned when the vessel is laden with homogeneous cargo; for vessels of less relative breadth, the freeboard should be so increased as to provide a sufficient range of stability, or other means adopted to secure the same.

11. *Erections on Deck.*—For steam vessels with top-gallant forecastles having long poops, or raised quarter-decks connected with bridge-houses, covering in the engine and boiler openings, the latter being entered from the top, and having an efficiently-

constructed iron bulkhead at the fore end, a deduction may be made from the reserve buoyancy given in the Tables, according to the following scale:—

- (a) When the combined length of the poop, or raised quarter-deck, bridge-house, and top-gallant forecastle is—

$\frac{8}{10}$ ths of the length of the vessel, deduct 85 per cent. of the reduction in the reserve buoyancy allowed for a complete awning deck, or $\frac{8.5}{10}$ ths of the difference between freeboards in Tables A (after correction for sheer) and Tables C.

$\frac{8}{10}$ ths of the length of the vessel, deduct 75 per cent. of the reduction in the reserve buoyancy allowed for a complete awning deck, or $\frac{7.5}{10}$ ths of the difference between freeboards in Tables A (after correction for sheer) and Tables C.

$\frac{7}{10}$ ths of the length of the vessel, deduct 63 per cent. of the reduction in the reserve buoyancy allowed for a complete awning deck, or $\frac{6.3}{10}$ ths of the difference between freeboards in Tables A (after correction for sheer) and Tables C.

$\frac{6}{10}$ ths of the length of the vessel, deduct 50 per cent. of the reduction in the reserve buoyancy allowed for a complete awning deck, or $\frac{5.0}{10}$ ths of the difference between freeboards in Tables A (after correction for sheer) and Tables C.

When the engine and boiler openings are protected only by a long raised quarter-deck, a less reduction in freeboard will be allowed.

- (b) For intermediate lengths of erections the amount of the reduction in freeboard should be ascertained by interpolation.

- (c) The above scale of allowance is prepared for vessels having long poops or raised quarter-decks 4 ft. high or above. For raised quarter-decks of less height, extending over $\frac{1}{10}$ ths of the length, and forming an integral portion of the vessel, the amount of the allowance should be diminished, as shown in the following table:—

Height of raised Quarter-deck.	Moulded Depth of Vessel in Feet.						
	ft. in. 10 0	ft. in. 12 0	ft. in. 14 0	ft. in. 16 0	ft. in. 18 0	ft. in. 20 0	ft. in. 22 0
ft. in.	in.	in.	in.	in.	in.	in.	in.
3 6	—	—	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$
3 0	$\frac{1}{2}$	$\frac{3}{4}$	1	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$
2 6	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2	$2\frac{1}{2}$	3
2 0	$1\frac{1}{2}$	$1\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{3}{4}$	—	—	—
1 6	2	$2\frac{1}{2}$	3	—	—	—	—

- (d) For shorter lengths of raised quarter-deck a proportionate increase should be made.

(e) It is to be understood in the application of this scale of allowance for erections on deck to vessels with long poops or with raised quarter-decks, and bridge-houses combined, that the deduction is a maximum deduction, applicable only to vessels of these types in which the erections are of a most substantial character, the deck openings most effectually protected, and the crew are either berthed in the bridge-house, or the arrangements to enable them to get backwards and forwards from their quarters are of a satisfactory character. For other vessels of the same class the amount of the deduction should be fixed only after a careful survey. Also such vessels when employed in the Atlantic trade will require to have specially provided greater freeboard than that given in the Tables.

(f) A sufficient number of clearing ports, as large as practicable, and with shutters properly hung, should be formed in the bulwarks of these vessels, between the fore-castle and the bridge-house, for the purpose of speedily clearing this part of the deck of water.

12. When the erections on a vessel consist of a top-gallant fore-castle, a short poop having an efficient bulkhead, and bridge-house disconnected, the latter in steamers covering the engine and boiler openings, and being efficiently enclosed with an iron bulkhead at each end, a deduction may be made from the reserve buoyancy given in the Tables according to the following scale:—

(a) When the combined length of the erections is—

$\frac{5}{10}$ ths of the length of the vessel, deduct 40 per cent. of the reduction in reserve buoyancy allowed for a complete awning deck or $\frac{2}{3}$ ths of the difference between the freeboards in Tables A (after correction for sheer and length) and Tables C (after correction for length).

$\frac{4}{10}$ ths of the length of the vessel, deduct 33 per cent. of the reduction in reserve buoyancy allowed for a complete awning deck or $\frac{1}{3}$ rd of the difference between the freeboards in Tables A (after correction for sheer and length) and Tables C (after correction for length).

13. When the erections on a vessel consist of a top-gallant fore-castle and bridge-house only, the latter in steamers covering the engine and boiler openings, and being efficiently enclosed with an iron bulkhead at each end, a deduction may be made from the reserve buoyancy given in the Tables according to the following scale:—

(a) When the combined length of the erections is—

$\frac{5}{10}$ ths of the length of the vessel, deduct 30 per cent. of the reduction in reserve buoyancy allowed for a complete awning deck or $\frac{3}{10}$ ths of the difference between the freeboards in Tables A (after correction for sheer and length) and Tables C (after correction for length).

$\frac{3}{10}$ ths of the length of the vessel, deduct 25 per cent. of the reduction in reserve buoyancy allowed for a complete awning deck or $\frac{1}{4}$ th of the difference between the freeboards in Tables A (after correction for sheer and length) and Tables C (after correction for length).

14. When the erections on a vessel consist of a short poop and top-gallant forecastle only, the former enclosed at the fore-end with an efficient bulkhead, the deduction from the reserve buoyancy given in the Tables should be according to the following scale :—

(a) When the combined length of the erections is—

$\frac{3}{8}$ ths of the length of the vessel, deduct 8 per cent. of the reserve buoyancy or 10 per cent. of the freeboard required for the vessel flush decked after correction for length ;

$\frac{2}{3}$ ths of the length of the vessel, deduct 6 per cent. of the reserve buoyancy or 8 per cent. of the freeboard required for the vessel flush decked after correction for length ;

and so on in proportion.

15. When a vessel is fitted with a top-gallant forecastle only, the reduction in reserve buoyancy should be one-half that prescribed by the previous paragraph for the case where, in addition to the forecastle, the vessel is fitted with a poop of the same length.

16. *Sheer*.—The Tables are framed for vessels having a mean sheer of deck *measured at the side*, as shown in the following Table :—

	Length over which Sheer is measured.						
	100	150	200	250	300	350	400
	Mean Sheer in Inches over the Length specified.						
<i>Flush-deck vessels</i> .—Sheer to be measured abreast stem and sternpost.	20	25	30	35	40	45	50
<i>Vessels having short poops and forecastles</i> .—Sheer to be measured at points distant $\frac{1}{4}$ th the length of the vessel from each end.	14	18	22	26	30	34	38
<i>Vessels having short forecastles only</i> .—Sheer to be measured abreast the sternpost and at a point distant $\frac{1}{4}$ th the length from the stem.	14 $\frac{1}{2}$	18 $\frac{1}{2}$	23	27	31	35 $\frac{1}{2}$	40

- (a) In flush-deck vessels and in vessels to which clauses 11 and 12 apply, when the sheer of deck is greater or less than the above, *and is of a gradual character*, divide the difference in inches between it and the mean sheer provided for by 4, and the result in inches is the amount by which the freeboard amidships should be diminished or increased according as the sheer is greater or less.
- (b) In vessels having short poops and forecastles, and in those having short forecastles only, the freeboard should be corrected in respect of the excess of or deficiency in reserve buoyancy due to variations in sheer from the standard amount over the length uncovered by substantial erections, as provided in the above Table. One-fourth the difference between the mean sheer specified and that measured as described is approximately the amount by which the freeboard should be modified in respect of sheer.
- (c) The divisor 4 is to be used when the sheer is *of a gradual character*, and is not strictly applicable either to those cases in which the sheer is suddenly increased at the bow or stern, or to those in which it does not maintain its normal rate of increase to the ends of the vessel.
- (d) In all cases the rise in sheer forward and aft is measured with reference to the deck at the middle of the length, and where the lowest point of the sheer is abaft the middle of the length, one-half of the difference between the sheer amidships and the lowest point should be added to the freeboard specified in the Tables for flush-deck vessels, and for vessels having short poops and forecastles only.
- (e) Where, as in some instances, vessels fitted with long poops or raised quarter-decks connected with bridge-houses have the deck line rising rapidly from amidships to the front of the bridge, and from that point onwards gradually approaching the normal sheer line, the freeboard may be slightly modified in consideration of the increase of height of deck in the "well."
- (f) In flush-deck vessels and in vessels having short poops and forecastles the excess of sheer for which an allowance is made shall not exceed one-half the total standard mean sheer for the size of ship.
- (g) No decrease should be made in the freeboard of spar and awning deck vessels in respect of excess of sheer.

17. *Round of Beam*.—In calculating the reserve of buoyancy an allowance has been made of one-quarter of an inch for every foot of the length of the midship beam for the round up. When

the round of the beam in flush-decked vessels is greater or less than given by this rule, divide the difference in inches by 2, and diminish or increase the freeboard by this amount. For vessels with erections on deck the amount of the allowance should depend on the extent of the main deck uncovered. This rule for round of beam does not apply to spar or awning deck vessels.

18. As a general illustration of the way in which the Tables should be used in modifying the freeboard on account of erections on deck, extreme proportions and variations in sheer, the following may be taken as an example.

A vessel is 234 ft. long, 29 ft. broad, and has a moulded depth of 17.0 ft., the coefficient of fineness being .72. Suppose the vessel to have a poop and a bridge-house of the united length of 121 ft., and a forecastle 20 ft. in length, and let the sheer forward, measured at the side, be 4 ft. 6 in., and aft 2 ft. 1 in.

	Ft.	in.
Freeboard by Tables A if of the normal length without erections, and with the normal amount of sheer	2	11
The mean sheer by rule is 33.4 in. or 6 in. less than that in the vessel, and the reduction in freeboard is 6 in. divided by 4	0	1½
Freeboard of vessel without erections and with 39½ in. mean sheer.....	2	9½
Freeboard by Tables C as awning-decked	1	4½
Difference ...	1	5

The combined length of the erection is $\frac{1}{2} \frac{4}{4}$ ths or $\frac{1}{10}$ ths of the length of the vessel and the allowance for erections under clause 11 will be therefore $\frac{1}{10}$ ths of 17 in., or 8½ in.

	Deduct.
We have therefore—	in.
Amount deducted from freeboard for excess of sheer	1½
Amount deducted from the freeboard for erections...	8½
Amount deducted if vessel be fitted with an uncovered iron main deck (clause 6) = $\frac{9}{10} \times 3\frac{1}{2}$...	2
	12

The length being 30 ft. in excess of that for which the Tables are framed, the addition to the freeboard in respect of the same is one-half of $\frac{3}{10}$ ths of 1 in., or

1½
10½

That is 10½ in. to be deducted from 2 ft. 11 in., leaving a winter freeboard of 2 ft. 0½ in.

Corresponding summer freeboard 1 ft. 10½ in.

19. Vessels loaded in fresh water may have less freeboard than that given in the several Tables according to the following scale :—

Moulded Depth in Feet.	Reduction in freeboard.		
	Vessels without erections on Deck.	Awning Deck Vessels.	Spar Deck Vessels.
	ins.	ins.	ins.
9 and under 11	2	—	—
11 " 13	2½	—	—
13 " 16	3	3½	4
16 " 19	3½	4	4½
19 " 22	4	4½	5
22 " 25	4½	5	5½
25 " 28	5	5½	6
28 " 31	5½	6	6½
31 " 34	6	6½	7

MEMO.—The weight of a cubic foot of salt water is taken, in the above Table, to be 64 lb., and that of fresh water 62·5 lb.

TABLES A.

TABLES OF FREEBOARD for FIRST-CLASS CARGO-CARRYING STEAM VESSELS not having SPAR or AWNING DECKS.

(For allowances admitted in vessels having erections on deck,
see "Explanation.")

TABLE A.

CARGO-CARRYING STEAM VESSELS NOT HAVING SPAR OR AWNING DECKS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-GOING IRON AND STEEL STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	PERCENTAGE RESERVE BUOYANCY.—(Winter.)							
	22.0	22.2	22.4	22.6	22.8	23.0	23.2	23.4
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.—(Winter.)							
	Measured from Top of Deck at Side.							
	Moulded Depth and Length.							
	ft. in. 10 0	ft. in. 10 6	ft. in. 11 0	ft. in. 11 6	ft. in. 12 0	ft. in. 12 6	ft. in. 13 0	ft. in. 13 6
	ft. 120	ft. 126	ft. 132	ft. 138	ft. 144	ft. 150	ft. 156	ft. 162
.68	ft. in. 1 4	ft. in. 1 5	ft. in. 1 6	ft. in. 1 7½	ft. in. 1 8½	ft. in. 1 9½	ft. in. 1 11	ft. in. 2 0
.70	1 4	1 5	1 6	1 7½	1 8½	1 9½	1 11	2 0½
.72	1 4½	1 5½	1 6½	1 8	1 9	1 10	1 11½	2 1
.74	1 4½	1 5½	1 6½	1 8	1 9	1 10	1 11½	2 1
.76	1 5	1 6	1 7	1 8½	1 9½	1 10½	2 0	2 1½
.78	1 5	1 6	1 7	1 8½	1 9½	1 11	2 0½	2 2
.80	1 5½	1 6½	1 7½	1 9	1 10	1 11½	2 1	2 2½
.82	1 5½	1 6½	1 7½	1 9	1 10	1 11½	2 1	2 2½
Correction in inches for a change of 10 ft. in the length.	.8	.9	.9	.9	.9	.9	.9	.9
Deduction in inches for Summer Voyages.	1	1	1	1	1	1	1	1½

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months.

TABLE A.—continued.

CARGO-CARRYING STEAM VESSELS NOT HAVING SPAR OR
AWNING DECKS.TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-
GOING IRON AND STEEL STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	PERCENTAGE RESERVE BUOYANCY.—(<i>Winter.</i>)					
	23.6	23.8	24.0	24.2	24.5	24.7
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)					
	Measured from Top of Deck at Side.					
	Moulded Depth and Length.					
	ft. in. 14 0	ft. in. 14 6	ft. in. 15 0	ft. in. 15 6	ft. in. 16 0	ft. in. 16 6
	ft. 168	ft. 174	ft. 180	ft. 186	ft. 192	ft. 198
.68	ft. in. 2 1½	ft. in. 2 3	ft. in. 2 4	ft. in. 2 5½	ft. in. 2 7	ft. in. 2 8½
.70	2 1½	2 3	2 4½	2 6	2 7½	2 9
.72	2 2	2 3½	2 5	2 6½	2 8	2 9½
.74	2 2½	2 4	2 5½	2 7	2 8½	2 10
.76	2 3	2 4½	2 6	2 7½	2 9	2 10½
.78	2 3	2 4½	2 6	2 7½	2 9	2 11
.80	2 3½	2 5	2 6½	2 8	2 9½	2 11½
.82	2 4	2 5½	2 7	2 8½	2 10	3 0
Correction in inches for a change of 10 ft. in the length.	1.0	1.0	1.0	1.0	1.0	1.0
Deduction in inches for Summer Voyages.	1½	1½	1½	1½	1½	2
Addition in inches for Winter. North Atlantic.	3	3	3	3	3	3

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive.

TABLE A.—*continued.*CARGO-CARRYING STEAM VESSELS NOT HAVING SPAR OR
AWNING DECKS.TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-
GOING IRON AND STEEL STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	PERCENTAGE RESERVE BUOYANCY.—(<i>Winter.</i>)				
	25·0	25·2	25·5	25·7	26·0
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)				
	Measured from Top of Deck at Side.				
	Moulded Depth and Length.				
	ft. in. 17 0	ft. in. 17 6	ft. in. 18 0	ft. in. 18 6	ft. in. 19 0
	ft. 204	ft. 210	ft. 216	ft. 222	ft. 228
·68	ft. in. 2 10	ft. in. 2 11½	ft. in. 3 1	ft. in. 3 2½	ft. in. 3 4
·70	2 10½	3 0	3 1½	3 3	3 4½
·72	2 11	3 0½	3 2	3 3½	3 5½
·74	2 11½	3 1	3 2½	3 4	3 6
·76	3 0	3 1½	3 3	3 5	3 6½
·78	3 0½	3 2	3 4	3 5½	3 7½
·80	3 1	3 2½	3 4½	3 6	3 8
·82	3 1½	3 3	3 5	3 6½	3 8½
Correction in inches for a change of 10 ft. in the length.	1·1	1·1	1·1	1·1	1·1
Deduction in inches for Summer Voyages.	2	2	2	2	2
Addition in inches for Winter. North Atlantic.	3	3	3	3½	3½

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive.

TABLE A.—*continued.*CARGO-CARRYING STEAM VESSELS NOT HAVING SPAR OR
AWNING DECKS.TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-
GOING IRON AND STEEL STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	PERCENTAGE RESERVE BUOYANCY.—(<i>Winter.</i>)					
	26.2	26.5	26.7	27.0	27.3	27.5
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)					
	Measured from Top of Deck at Side.					
	Moulded Depth and Length.					
	ft. in. 19 6	ft. in. 20 0	ft. in. 20 6	ft. in. 21 0	ft. in. 21 6	ft. in. 22 0
	ft. 234	ft. 240	ft. 246	ft. 252	ft. 258	ft. 264
.68	ft. in. 3 5½	ft. in. 3 7½	ft. in. 3 9	ft. in. 3 11	ft. in. 4 0½	ft. in. 4 2½
.70	3 6½	3 8	3 10	3 11½	4 1½	4 3½
.72	3 7	3 8½	3 10½	4 0	4 2	4 4
.74	3 8	3 9½	3 11½	4 1	4 3	4 5
.76	3 8½	3 10	4 0	4 1½	4 3½	4 5½
.78	3 9½	3 11	4 1	4 2½	4 4½	4 6½
.80	3 10	3 11½	4 1½	4 3	4 5	4 7
.82	3 10½	4 0	4 2	4 3½	4 5½	4 7½
Correction in inches for a change of 10 ft. in the length.	1.1	1.2	1.2	1.2	1.2	1.2
Deduction in inches for Summer Voyages.	2½	2½	2½	2½	2½	2½
Addition in inches for Winter. North Atlantic.	3½	3½	3½	3½	4	4

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLE A.—*continued.*CARGO-CARRYING STEAM VESSELS NOT HAVING SPAR OR
AWNING DECKS.TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-
GOING IRON AND STEEL STEAM VESSELS.

(In Salt Water.)

Coefficient of of Fineness.	PERCENTAGE RESERVE BUOYANCY.—(<i>Winter.</i>)					
	27·8	28·1	28·3	28·6	28·9	29·2
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)					
	Measured from Top of Deck at Side.					
	Moulded Depth and Length.					
	ft. in. 22 6	ft. in. 23 0	ft. in. 23 6	ft. in. 24 0	ft. in. 24 6	ft. in. 25 0
	ft. 270	ft. 276	ft. 282	ft. 288	ft. 294	ft. 300
·68	ft. in. 4 4½	ft. in. 4 6½	ft. in. 4 8½	ft. in. 4 10½	ft. in. 5 1	ft. in. 5 3½
·70	4 5½	4 7½	4 9½	4 11½	5 1½	5 4
·72	4 6	4 8	4 10	5 0	5 2½	5 5
·74	4 7	4 9	4 11	5 1	5 3	5 5½
·76	4 7½	4 9½	4 11½	5 1½	5 4	5 6½
·78	4 8½	4 10½	5 0½	5 2½	5 4½	5 7
·80	4 9	4 11	5 1	5 3	5 5½	5 8
·82	4 9½	4 11½	5 2	5 4	5 6½	5 9
Correction in inches for a change of 10 feet in the length.	1·2	1·2	1·3	1·3	1·3	1·3
Deduction in inches for Summer Voyages.	3	3	3	3	3	3½
Addition in inches for Winter. North Atlantic.	4	4	4	4	4	4½

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, or call at, ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLE A.—*continued.*CARGO-CARRYING STEAM VESSELS NOT HAVING SPAR OR
AWNING DECKS.TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-
GOING IRON AND STEEL STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	PERCENTAGE RESERVE BUOYANCY.—(<i>Winter.</i>)					
	29·5	29·8	30·1	30·4	30·8	31·1
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)					
	Measured from Top of Deck at Side.					
	Moulded Depth and Length.					
	ft. in. 25 6	ft. in. 26 0	ft. in. 26 6	ft. in. 27 0	ft. in. 27 6	ft. in. 28 0
	ft. 306	ft. 312	ft. 318	ft. 324	ft. 330	ft. 336
·68	ft. in. 5 5½	ft. in. 5 8	ft. in. 5 10	ft. in. 5 10½	ft. in. 6 0½	ft. in. 6 5½
·70	5 6	5 8½	5 10½	6 1	6 3½	6 6½
·72	5 7	5 9½	5 11½	6 2	6 4½	6 7½
·74	5 7½	5 10	6 0½	6 3	6 5½	6 8½
·76	5 8½	5 11	6 1½	6 4	6 6½	6 9½
·78	5 9	5 11½	6 2	6 4½	6 7	6 10
·80	5 10	6 0½	6 3	6 5½	6 8	6 11
·82	5 11	6 1½	6 4	6 6½	6 9	7 0
Correction in inches for a change of 10 feet in the length.	1·3	1·4	1·4	1·4	1·4	1·4
Deduction in inches for Summer Voyages.	3½	3½	3½	4	4	4
Addition in inches for Winter. North Atlantic.	4½	4½	4½	4½	4½	5

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, or call at, ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLE A.—*continued.*CARGO-CARRYING STEAM VESSELS NOT HAVING SPAR OR
AWNING DECKS.TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-
GOING IRON AND STEEL STEAM VESSELS.

(In Salt Water.)

Co-efficient of Fineness.	PERCENTAGE RESERVE BUOYANCY.—(<i>Winter.</i>)					
	31·5	31·8	32·2	32·5	32·8	33·2
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)					
	Measured from Top of Deck at Side.					
	Moulded Depth and Length.					
	ft. in. 28 6	ft. in. 29 0	ft. in. 29 6	ft. in. 30 0	ft. in. 30 6	ft. in. 31 0
	ft. 342	ft. 348	ft. 354	ft. 360	ft. 366	ft. 372
·68	ft. in. 6 8	ft. in. 6 10½	ft. in. 7 1	ft. in. 7 3½	ft. in. 7 6½	ft. in. 7 9
·70	6 9	7 0	7 2½	7 5	7 8	7 10½
·72	6 10	7 1	7 3½	7 6	7 9	7 11½
·74	6 11	7 2	7 4½	7 7	7 10	8 0½
·76	7 0	7 3	7 5½	7 8	7 11	8 1½
·78	7 1	7 4	7 7	7 9½	8 0½	8 3
·80	7 2	7 5	7 8	7 10½	8 1½	8 4
·82	7 3	7 6	7 9	7 11½	8 2½	8 5
Correction in inches for a change of 10 ft. in the length.	1·5	1·5	1·5	1·5	1·5	1·6
Deduction in inches for Summer Voyages.	4	4½	4½	4½	5	5
Addition in inches for Winter. North Atlantic.	5	5	5	5	5½	5½

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLE A.—*continued.*CARGO-CARRYING STEAM VESSELS NOT HAVING SPAR OR
AWNING DECKS.TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-
GOING IRON AND STEEL STEAM VESSELS.

(In Salt Water.)

Co-efficient of Fineness.	PERCENTAGE RESERVE BUOYANCY.—(<i>Winter.</i>)					
	33·5	33·8	34·1	34·4	34·7	35·0
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)					
	Measured from Top of Deck at Side.					
	Moulded Depth and Length.					
	ft. in. 31 6	ft. in. 32 0	ft. in. 32 6	ft. in. 33 0	ft. in. 33 6	ft. in. 34 0
	ft. 378	ft. 384	ft. 390	ft. 396	ft. 402	ft. 408
·68	ft. in. 8 0	ft. in. 8 2½	ft. in. 8 5	ft. in. 8 7½	ft. in. 8 10½	ft. in. 9 1
·70	8 1½	8 4	8 6½	8 9	9 0	9 2½
·72	8 2½	8 5	8 7½	8 10	9 1	9 3½
·74	8 3½	8 6	8 9	8 11½	9 2½	9 5
·76	8 4½	8 7	8 10	9 0½	9 3½	9 6
·78	8 6	8 8½	8 11½	9 2	9 5	9 7½
·80	8 7	8 9½	9 0½	9 3	9 6	9 8½
·82	8 8	8 10½	9 1½	9 4	9 7	9 10
Correction in inches for a change of 10 ft. in the length.	1·6	1·6	1·6	1·6	1·7	1·7
Deduction in inches for Summer Voyages.	5	5	5½	5½	5½	6
Addition in inches for Winter. North Atlantic.	5½	5½	6	6	6	6

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLES B.

TABLES OF FREEBOARD FOR FIRST-CLASS CARGO-CARRYING
SPAR DECK VESSELS.

TABLE B.

CARGO-CARRYING SPAR DECK VESSELS.

TABLE OF FREEBOARD TO SPAR DECK FOR FIRST-CLASS SEA-GOING
SPAR DECK STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)* Measured from Top of Spar Deck at Side.					
	Moulded Depth (to Main Deck) and Length.					
	ft. in. 16 0	ft. in. 16 6	ft. in. 17 0	ft. in. 17 6	ft. in. 18 0	ft. in. 18 6
	ft. 276	ft. 282	ft. 288	ft. 294	ft. 300	ft. 306
·68	ft. in. 5 11	ft. in. 6 0	ft. in. 6 1½	ft. in. 6 2½	ft. in. 6 4	ft. in. 6 5½
·70½	5 11½	6 0½	6 2	6 3½	6 5	6 6½
·72½	6 0	6 1	6 2½	6 4	6 5½	6 7
·74	6 0½	6 1½	6 3	6 4½	6 6	6 7½
·76	6 1	6 2	6 3½	6 5	6 6½	6 8
·78	6 1½	6 2½	6 4	6 5½	6 7	6 8½
·80	6 2	6 3	6 4½	6 6	6 7½	6 9
·82	6 2½	6 3½	6 5	6 6½	6 8	6 9½
Correction in inches for a change of 10 ft. in the length.	1·0	1·0	1·0	1·0	1·0	1·0
Deduction in inches for Summer Voyages.	2½	2½	3	3	3	3
Addition in inches for Winter. North Atlantic.	3½	3½	4	4	4	4

* These tables apply to spar deck vessels in which the height at side between the main and spar decks is 7 ft. from top of beam to top of beam; when this height is greater or less than 7 ft. the freeboard to the spar deck will require modification.

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLE B.—*continued.*

CARGO-CARRYING SPAR DECK VESSELS.

TABLE OF FREEBOARD TO SPAR DECK FOR FIRST-CLASS SEA-GOING
SPAR DECK STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)* Measured from Top of Spar Deck at Side.					
	Moulded Depth (to Main Deck) and Length.					
	ft. in. 19 0	ft. in. 19 6	ft. in. 20 0	ft. in. 20 6	ft. in. 21 0	ft. in. 21 6
	ft. 312	ft. 318	ft. 324	ft. 330	ft. 336	ft. 342
·68	ft. in. 6 7½	ft. in. 6 9	ft. in. 6 11	ft. in. 7 0½	ft. in. 7 2½	ft. in. 7 4½
·70	6 8½	6 10	7 0	7 1½	7 3½	7 5½
·72	6 9	6 10½	7 0½	7 2	7 4	7 6
·74	6 9½	6 11	7 1	7 3	7 5	7 7
·76	6 10	6 11½	7 1½	7 3½	7 5½	7 7½
·78	6 10½	7 0	7 2	7 4	7 6	7 8
·80	6 11	7 0¾	7 2½	7 4½	7 6½	7 8½
·82	6 11½	7 1	7 3	7 5	7 7	7 9
Correction in inches for a change of 10 ft. in the length.	1·1	1·1	1·1	1·1	1·1	1·2
Deduction in inches for Summer Voyages.	3½	3½	3½	4	4	4
Addition in inches for Winter. North Atlantic.	4½	4½	4½	4½	5	5

* These tables apply to spar deck vessels in which the height at side between the main and spar decks is 7 ft. from top of beam to top of beam; when this height is greater or less than 7 ft. the freeboard to the spar deck will require modification.

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLE B.—*continued.*

CARGO-CARRYING SPAR DECK VESSELS.

TABLE OF FREEBOARD TO SPAR DECK FOR FIRST-CLASS SEA-GOING
SPAR DECK STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)* Measured from Top of Spar Deck at Side.					
	Moulded Depth (to Main Deck) and Length.					
	ft. 22 in. 0	ft. 22 in. 6	ft. 23 in. 0	ft. 23 in. 6	ft. 24 in. 0	ft. 24 in. 6
	ft. 348	ft. 354	ft. 360	ft. 366	ft. 372	ft. 378
	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
·68	7 7	7 9	7 11½	8 2	8 4½	8 7
·70	7 8	7 10	8 0½	8 3	8 5½	8 8
·72	7 8½	7 10½	8 1	8 3½	8 6	8 8½
·74	7 9½	7 11½	8 2	8 4½	8 7	8 9½
·76	7 10	8 0	8 2½	8 5	8 7½	8 10
·78	7 10½	8 0½	8 3	8 5½	8 8	8 11
·80	7 11	8 1	8 3½	8 6	8 8½	8 11½
·82	7 11½	8 1½	8 4	8 7	8 9½	9 0½
Correction in inches for a change of 10 ft. in the length.	1·2	1·2	1·2	1·2	1·3	1·3
Deduction in inches for Summer Voyages.	4½	4½	4½	5	5	5
Addition in inches for Winter. North Atlantic.	5	5	5	5½	5½	5½

* These tables apply to spar deck vessels in which the height at side between the main and spar decks is 7 ft. from top of beam to top of beam; when this height is greater or less than 7 ft. the freeboard to the spar deck will require modification.

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLE B.—*continued.*

CARGO-CARRYING SPAR DECK VESSELS.

TABLE OF FREEBOARD TO SPAR DECK FOR FIRST-CLASS SEA-GOING
SPAR DECK STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)* Measured from Top of Spar Deck at Side.					
	Moulded Depth (to Main Deck) and Length.					
	ft. in. 25 0	ft. in. 25 6	ft. in. 26 0	ft. in. 26 6	ft. in. 27 0	ft. in. 27 6
	ft. 384	ft. 390	ft. 396	ft. 402	ft. 408	ft. 414
·68	ft. in. 8 9½	ft. in. 9 0	ft. in. 9 2½	ft. in. 9 5½	ft. in. 9 8	ft. in. 9 11
·70	8 10½	9 1	9 3½	9 6½	9 9	10 0
·72	8 11	9 2	9 4½	9 7½	9 10	10 1
·74	9 0	9 3	9 5½	9 8½	9 11	10 2
·76	9 0½	9 3½	9 6	9 9	10 0	10 3
·78	9 1½	9 4½	9 7	9 10	10 1	10 4
·80	9 2	9 5	9 7½	9 10½	10 1½	10 4½
·82	9 3	9 6	9 8½	9 11½	10 2½	10 5½
Correction in inches for a change of 10 ft. in the length.	1·3	1·3	1·3	1·4	1·4	1·4
Deduction in inches for Summer Voyages.	5½	5½	5½	5½	6	6
Addition in inches for Winter. North Atlantic.	5½	5½	6	6	6	6½

* These tables apply to spar deck vessels in which the height at side between the main and spar decks is 7 ft. from top of beam to top of beam; when this height is greater or less than 7 ft. the freeboard to the spar deck will require modification.

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or Eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLE B.—*continued.*

CARGO-CARRYING SPAR DECK VESSELS.

TABLE OF FREEBOARD TO SPAR DECK FOR FIRST-CLASS SEA-GOING
SPAR DECK STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)*				
	Measured from Top of Spar Deck at Side.				
	Moulded Depth (to Main Deck) and Length.				
	ft. in. 28 0	ft. in. 28 6	ft. in. 29 0	ft. in. 29 6	ft. in. 30 0
	ft. 420	ft. 426	ft. 432	ft. 438	ft. 444
·68	ft. in. 10 2	ft. in. 10 5	ft. in. 10 8½	ft. in. 10 11½	ft. in. 11 3
·70	10 3	10 6	10 9½	11 0½	11 4
·72	10 4	10 7	10 10½	11 1½	11 5
·74	10 5	10 8	10 11½	11 2½	11 6
·76	10 6	10 9	11 0½	11 3½	11 7
·78	10 7	10 10	11 1½	11 4½	11 8
·80	10 7½	10 10½	11 2	11 5½	11 9
·82	10 8½	10 11½	11 3	11 6½	11 10
Correction in inches for a change of 10 ft. in the length.	1·4	1·5	1·5	1·5	1·5
Deduction in inches for Summer Voyages.	6	6	6½	6½	6½
Addition in inches for Winter. North Atlantic.	6	6	6½	6½	6½

*These tables apply to spar deck vessels in which the height at side between the main and spar decks is 7 ft. from top of beam to top of beam; when this height is greater or less than 7 ft. the freeboard to the spar deck will require modification.

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLES C.

TABLES OF FREEBOARD FOR FIRST-CLASS CARGO-CARRYING
AWNING DECK VESSELS.

TABLE C.

CARGO-CARRYING AWNING DECK VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS
SEA-GOING AWNING DECK STEAM VESSELS.
(In Salt Water.)

Coefficient of Fineness.	PERCENTAGE RESERVE BUOYANCY TO MAIN DECK.— (Winter.)					
	15·0	15·1	15·2	15·3	15·4	15·5
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.—(Winter.)					
	Measured from Top of Main Deck at Side.					
	Moulded Depth (to Main Deck) and Length.					
	ft. in. 14 0	ft. in. 14 6	ft. in. 15 0	ft. in. 15 6	ft. in. 16 0	ft. in. 16 6
	ft. 168	ft. 174	ft. 180	ft. 186	ft. 192	ft. 198
·66	ft. in. 1 0	ft. in. 1 0½	ft. in. 1 1	ft. in. 1 1½	ft. in. 1 2	ft. in. 1 2½
·68	1 0	1 0½	1 1	1 1½	1 2	1 2½
·70	1 0½	1 1	1 1½	1 2	1 2½	1 3
·72	1 0½	1 1	1 1½	1 2	1 3	1 3½
·74	1 1	1 1½	1 2	1 2½	1 3	1 3½
·76	1 1	1 1½	1 2	1 2½	1 3½	1 4
·78	1 1½	1 2	1 2½	1 3	1 4	1 4½
·80	1 1½	1 2	1 2½	1 3	1 4	1 4½
Correction in inches for a change of 10 ft. in the length.	·5	·5	·5	·5	·5	·5
Deduction in inches for Summer Voyages.	2	2	2	2	2	2½
Addition in inches for Winter. North Atlantic.	3	3	3	3	3	3½

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLE C.—*continued*.

CARGO-CARRYING AWNING DECK VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS
SEA-GOING AWNING DECK STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	PERCENTAGE RESERVE BUOYANCY TO MAIN DECK.— (Winter.)					
	15·7	15·8	16·0	16·2	16·4	16·7
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.—(Winter.)					
	Measured from Top of Main Deck at Side.					
	Moulded Depth (to Main Deck) and Length.					
	ft. in. 17 0	ft. in. 17 6	ft. in. 18 0	ft. in. 18 6	ft. in. 19 0	ft. in. 19 6
	ft. 204	ft. 210	ft. 216	ft. 222	ft. 228	ft. 234
·66	ft. in. 1 3½	ft. in. 1 4	ft. in. 1 5	ft. in. 1 6	ft. in. 1 7	ft. in. 1 8
·68	1 3½	1 4	1 5	1 6	1 7	1 8
·70	1 4	1 4½	1 5½	1 6½	1 7½	1 8½
·72	1 4½	1 5	1 6	1 7	1 8	1 9
·74	1 4½	1 5	1 6	1 7	1 8½	1 9
·76	1 5	1 5½	1 6½	1 7½	1 8½	1 9½
·78	1 5½	1 6	1 7	1 8	1 9	1 10
·80	1 5½	1 6	1 7	1 8	1 9	1 10
Correction in inches for a change of 10 ft. in the length.	·5	·5	·5	·6	·6	·6
Deduction in inches for Summer Voyages.	2½	2½	2½	3	3	3
Addition in inches for Winter. North Atlantic.	3½	3½	3½	3½	4	4

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLE C.—*continued.*

CARGO-CARRYING AWNING DECK VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS
SEA-GOING AWNING DECK STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	PERCENTAGE RESERVE BUOYANCY TO MAIN DECK.— (<i>Winter.</i>)					
	16·9	17·2	17·4	17·7	18·0	18·3
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)					
	Measured from Top of Main Deck at Side.					
	Moulded Depth (to Main Deck) and Length.					
	ft. in. 20 0	ft. in. 20 6	ft. in. 21 0	ft. in. 21 6	ft. in. 22 0	ft. in. 22 6
	ft. 240	ft. 246	ft. 252	ft. 258	ft. 264	ft. 270
·66	ft. in. 1 9	ft. in. 1 10½	ft. in. 1 11½	ft. in. 2 1	ft. in. 2 2	ft. in. 2 3½
·68	1 9	1 10½	1 11½	2 1	2 2½	2 4
·70	1 9½	1 11	2 0	2 1½	2 3	2 4½
·72	1 10	1 11½	2 0½	2 2	2 3½	2 5
·74	1 10	1 11½	2 0½	2 2	2 3½	2 5
·76	1 10½	2 0	2 1	2 2½	2 4	2 5½
·78	1 11	2 0½	2 1½	2 3	2 4½	2 6
·80	1 11½	2 1	2 2	2 3½	2 5	2 6½
Correction in inches for a change of 10 ft. in the length.	·6	·6	·6	·6	·6	·6
Deduction in inches for Summer Voyages.	3½	3½	3½	3½	4	4
Addition in inches for Winter. North Atlantic.	4	4	4	4½	4½	4½

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLE C.—*continued.*

CARGO-CARRYING AWNING DECK VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS
SEA-GOING AWNING DECK STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	PERCENTAGE RESERVE BUOYANCY TO MAIN DECK.— (<i>Winter.</i>)					
	18·6	18·9	19·2	19·6	19·9	20·3
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)					
	Measured from top of Main Deck at Side.					
	Moulded Depth (to Main Deck) and Length.					
	ft. in. 23 0	ft. in. 23 6	ft. in. 24 0	ft. in. 24 6	ft. in. 25 0	ft. in. 25 6
	ft. 276	ft. 282	ft. 288	ft. 294	ft. 300	ft. 306
·66	ft. in. 2 5	ft. in. 2 6½	ft. in. 2 8	ft. in. 2 10	ft. in. 3 0	ft. in. 3 2
·68	2 5½	2 7	2 8½	2 10½	3 0½	3 2½
·70	2 6	2 7½	2 9	2 11	3 1	3 3
·72	2 6½	2 8	2 9½	2 11½	3 1½	3 3½
·74	2 6½	2 8	2 10	3 0	3 2	3 4
·76	2 7	2 8½	2 10½	3 0½	3 2½	3 4½
·78	2 7½	2 9	2 11	3 1	3 3	3 5
·80	2 8	2 9½	2 11½	3 1½	3 3½	3 5½
Correction in inches for a change of 10 ft. in the length.	·6	·6	·6	·7	·7	·7
Deduction in inches for Summer Voyages.	4	4½	4½	4½	5	5
Addition in inches for Winter. North Atlantic.	4½	4½	5	5	5	5

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to or from, or call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLE C.—continued.

CARGO-CARRYING AWNING DECK VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS
SEA-GOING AWNING DECK STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	PERCENTAGE RESERVE BUOYANCY TO MAIN DECK.— (Winter.)					
	20·6	21·0	21·4	21·9	22·3	22·8
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.—(Winter.)					
	Measured from Top of Main Deck at Side.					
	Moulded Depth (to Main Deck) and Length.					
	ft. in. 26 0	ft. in. 26 6	ft. in. 27 0	ft. in. 27 6	ft. in. 28 0	ft. in. 28 6
	ft. 312	ft. 318	ft. 324	ft. 330	ft. 336	ft. 342
·66	ft. in. 3 4	ft. in. 3 6½	ft. in. 3 9	ft. in. 3 11½	ft. in. 4 2	ft. in. 4 4½
·68	3 4½	3 7	3 9½	4 0	4 2½	4 5
·70	3 5	3 7½	3 10	4 0½	4 3	4 5½
·72	3 5½	3 8	3 10½	4 1	4 3½	4 6½
·74	3 6	3 8½	3 11	4 1½	4 4	4 7
·76	3 7	3 9½	4 0	4 2½	4 5	4 7½
·78	3 7½	3 10	4 0½	4 3	4 5½	6 8
·80	3 8	3 10½	4 1	4 3½	4 6	4 8½
Correction in inches for a change of 10 ft. in the length.	·7	·7	·7	·7	·7	·7
Deduction in inches for Summer Voyages.	5	5½	5½	5½	5½	6
Addition in inches for Winter. North Atlantic.	5½	5½	5½	5½	5½	6

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to or from, or call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLE C.—*continued.*

CARGO-CARRYING AWNING DECK VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS
SEA-GOING AWNING DECK STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	PERCENTAGE RESERVE BUOYANCY TO MAIN DECK.— (<i>Winter.</i>)					
	23·3	23·8	24·3	24·7	25·2	25·6
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)					
	Measured from Top of Main Deck at Side.					
	Moulded Depth (to Main Deck) and Length.					
	ft. in. 29 0	ft. in. 29 6	ft. in. 30 0	ft. in. 30 6	ft. in. 31 0	ft. in. 31 6
	ft. 348	ft. 354	ft. 360	ft. 366	ft. 372	ft. 378
·66	ft. in. 4 7	ft. in. 4 9½	ft. in. 5 0	ft. in. 5 2½	ft. in. 5 5½	ft. in. 5 8
·68	4 7½	4 10	5 1	5 3½	5 6½	5 9
·70	4 8	4 10½	5 1½	5 4	5 7	5 9½
·72	4 9	4 11½	5 2½	5 5	5 8	5 10½
·74	4 9½	5 0	5 3	5 5½	5 8½	5 11
·76	4 10	5 1	5 4	5 6½	5 9½	6 0
·78	4 10½	5 1½	5 4½	5 7	5 10	6 0½
·80	4 11	5 2	5 5	4 7½	5 10½	6 1
Correction in inches for a change of 10 ft. in the length.	} ·7	·8	·8	·8	·8	·8
Deduction in inches for Summer Voyages.	} 6	6	6	6	6	6½
Addition in inches for Winter. North Atlantic.	} 6	6	6	6	6	6½

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European port, and which may sail to, or from, or call at, ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLE C.—*continued.*

CARGO-CARRYING AWNING DECK VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS
SEA-GOING AWNING DECK STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	PERCENTAGE RESERVE BUOYANCY TO MAIN DECK.— (<i>Winter.</i>)				
	26·1	26·5	27·0	27·5	28·0
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.—(<i>Winter.</i>)				
	Measured from Top of Main Deck at Side.				
	Moulded Depth (to Main Deck) and Length.				
	ft. in. 32 0	ft. in. 32 6	ft. in. 33 0	ft. in. 33 6	ft. in. 34 0
	ft. 384	ft. 390	ft. 396	ft. 402	ft. 408
·66	ft. in. 5 11	ft. in. 6 1½	ft. in. 6 4½	ft. in. 6 7	ft. in. 6 10
·68	6 0	6 2½	6 5½	6 8	6 11
·70	6 0½	6 3	6 6	6 8½	6 11½
·72	6 1½	6 4	6 7	6 9½	7 0½
·74	6 2	6 4½	6 7½	6 10	7 1
·76	6 3	6 5½	6 8½	6 11	7 2
·78	6 3½	6 6	6 9	6 11½	7 2½
·80	6 4	6 7	6 9½	7 0½	7 3½
Correction in inches for a change of 10 ft. in the length.	} ·8	·8	·8	·8	·8
Deduction in inches for Summer Voyages.	} 6½	6½	6½	6½	6½
Addition in inches for Winter. North Atlantic.	} 6½	6½	6½	6½	6½

The above reduction in freeboard for summer voyages from European and Mediterranean Ports is to be made from April to September inclusive. In other parts of the world the reduced freeboard should be used during the corresponding or recognised summer months. The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, at call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive. Double the above reduction to be allowed for voyages in the fine season in the Indian seas, between the limits of Suez and Singapore.

TABLES D.

TABLES OF FREEBOARD for FIRST-CLASS IRON, STEEL, COMPOSITE,
and WOOD SAILING VESSELS.

TABLE D.

SAILING VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-
GOING IRON AND STEEL SAILING VESSELS AND COMPOSITE AND WOOD
VESSELS OF THE HIGHEST CLASS.

(In Salt Water.)

Coefficient of Fineness.			PERCENTAGE RESERVE BUOYANCY. (Iron Vessels.)				
			23·5	23·7	23·9	24·2	24·4
			CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.				
			Measured from Top of Deck at Side.				
Wood.	Composite.	Iron.	Moulded Depth and Length.				
			ft. in. 10 0	ft. in. 10 6	ft. in. 11 0	ft. in. 11 6	ft. in. 12 0
			ft. 100	ft. 105	ft. 110	ft. 115	ft. 120
—	—	·64	ft. in. 1 5½	ft. in. 1 6½	ft. in. 1 7½	ft. in. 1 9	ft. in. 1 10½
—	·64	·66	1 5½	1 6½	1 7½	1 9	1 10½
—	·66	·68	1 6	1 7	1 8	1 9½	1 11
·64	·68	·70	1 6	1 7	1 8½	1 10	1 11½
·66	·70	·72	1 6½	1 7½	1 9	1 10½	2 0
·68	·72	·74	1 6½	1 7½	1 9	1 10½	2 0
·70	·74	—	1 7	1 8	1 9½	1 11	2 0½
·72	—	—	1 7	1 8½	1 10	1 11½	2 1
Corrections in inches for a change of 10 ft. in the length.			{ .9	.9	.9	1·0	1·0

TABLE D.—*continued.*

SAILING VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-GOING IRON AND STEEL SAILING VESSELS AND COMPOSITE AND WOOD VESSELS OF THE HIGHEST CLASS.

(In Salt Water.)

Coefficient of Fineness.			PERCENTAGE RESERVE BUOYANCY. (Iron Vessels.)			
			24·6	24·9	25·1	25·3
			CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS. Measured from Top of Deck at Side.			
Wood.	Composite.	Iron.	Moulded Depth and Length.			
			ft. in. 12 6	ft. in. 13 0	ft. in. 13 6	ft. in. 14 0
			ft. 125	ft. 130	ft. 135	ft. 140
—	—	·64	ft. in. 1 11½	ft. in. 2 1	ft. in. 2 2½	ft. in. 2 3½
—	·64	·66	2 0	2 1½	2 3	2 4
—	·66	·68	2 0½	2 2	2 3½	2 4½
·64	·68	·70	2 1	2 2½	2 4	2 5
·66	·70	·72	2 1½	2 3	2 4½	2 5½
·68	·72	·74	2 1½	2 3	2 4½	2 6
·70	·74	—	2 2	2 3½	2 5	2 6½
·72	—	—	2 2½	2 4	2 5½	2 7
Correction in inches for a change of 10 ft. in the length.			1·0	1·0	1·0	1·0

TABLE D.—*continued.*

SAILING VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-GOING IRON AND STEEL SAILING VESSELS AND COMPOSITE AND WOOD VESSELS OF THE HIGHEST CLASS.

(In Salt Water.)

Coefficient of Fineness.			PERCENTAGE RESERVE BUOYANCY. (Iron Vessels.)				
			25·5	25·7	26·0	26·2	26·4
			CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS. Measured from Top of Deck at Side.				
Wood.	Composite.	Iron.	Moulded Depth and Length.				
			ft. in. 14 6	ft. in. 15 0	ft. in. 15 6	ft. in. 16 0	ft. in. 16 6
			ft. 145	ft. 150	ft. 155	ft. 160	ft. 165
—	—	·64	ft. in. 2 5	ft. in. 2 6½	ft. in. 2 8	ft. in. 2 9½	ft. in. 2 11
—	·64	·66	2 5½	2 7	2 8½	8 10	2 11½
—	·66	·68	2 6	2 7½	2 9	2 10½	3 0
·64	·68	·70	2 6½	2 8	2 9½	2 11	3 0½
·66	·70	·72	2 7	2 8½	2 10	2 11½	3 1
·68	·72	·74	2 7½	2 9	2 10½	3 0	3 1½
·70	·74	—	2 8	2 9½	2 11	3 0½	3 2
·72	—	—	2 8½	2 10	2 11½	3 1	3 2½
Correction in inches for a change of 10 ft. in the length.			} 1·1	1·1	1·1	1·1	1·1
Addition in inches for Winter. North Atlantic.			} 3	3	3	3	3

The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, or call at Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive.

TABLE D.—*continued.*

SAILING VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-GOING IRON AND STEEL SAILING VESSELS AND COMPOSITE AND WOOD VESSELS OF THE HIGHEST CLASS.

(In Salt Water.)

Coefficient of Fineness.			PERCENTAGE RESERVE BUOYANCY. (Iron Vessels.)				
			26·6	26·8	27·1	27·3	27·5
			CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.				
			Measured from Top of Deck at Side.				
Wood.	Composite.	Iron.	Moulded Depth and Length.				
			ft. in. 17 0	ft. in. 17 6	ft. in. 18 0	ft. in. 18 6	ft. in. 19 0
			ft. 170	ft. 175	ft. 180	ft. 185	ft. 190
—	—	·64	ft. in. 3 0½	ft. in. 3 2	ft. in. 3 3½	ft. in. 3 5	ft. in. 3 6½
—	·64	·66	3 1	3 2½	3 4	3 5½	3 7
—	·66	·68	3 1½	3 3	3 4½	3 6	3 7½
·64	·68	·70	3 2	3 3½	3 5	3 6½	3 8
·66	·70	·72	3 2½	3 4	3 5½	3 7½	3 9
·68	·72	·74	3 3	3 4½	3 6	3 8	3 9½
·70	·74	—	3 3½	3 5	3 6½	3 8½	3 10
·72	—	—	3 4	3 5½	3 7	3 9	3 10½
Correction in inches for a change of 10 ft. in the length.			} 1·1	1·1	1·1	1·1	1·2
Addition in inches for Winter. North Atlantic.			} 3	3½	3½	3½	3½

The additional freeboard specified for the North Atlantic trades is to apply to vessels, sailing to, or from, the Mediterranean, or any British or European Port, and which may sail to, or from, or call at Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive.

TABLE D.—*continued.*

SAILING VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-GOING IRON AND STEEL SAILING VESSELS AND COMPOSITE AND WOOD VESSELS OF THE HIGHEST CLASS.

(In Salt Water.)

Coefficient of Fineness.			PERCENTAGE RESERVE BUOYANCY. (Iron Vessels.)				
			27·7	27·9	28·1	28·3	28·5
			CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS. Measured from Top of Deck at Side.				
Wood.	Composite.	Iron.	Moulded Depth and Length.				
			ft. in. 19 6	ft. in. 20 0	ft. in. 20 6	ft. in. 21 0	ft. in. 21 6
			ft. 195	ft. 200	ft. 205	ft. 210	ft. 215
—	—	·64	ft. in. 3 8	ft. in. 3 9½	ft. in. 3 11½	ft. in. 4 1	ft. in. 4 2½
—	·64	·66	3 8½	3 10	4 0	4 1½	4 3½
—	·66	·68	3 9	3 11	4 0½	4 2	4 4
·64	·68	·70	3 9½	3 11½	4 1	4 2½	4 4½
·66	·70	·72	3 10½	4 0½	4 2	4 3½	4 5½
·68	·72	·74	3 11	4 1	4 2½	4 4	4 6
·70	·74	—	3 11½	4 1½	4 3	4 5	4 6½
·72	—	—	4 0	4 2	4 3½	4 5½	4 7½
Correction in inches for a change of 10 ft. in the length.			1·2	1·2	1·2	1·2	1·2
Addition in inches for Winter. North Atlantic.			4	4	4	4	4

The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern Ports in the United States, north of, and including Baltimore, from October to March inclusive.

TABLE D.—*continued.*

SAILING VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-GOING IRON AND STEEL SAILING VESSELS AND COMPOSITE AND WOOD VESSELS OF THE HIGHEST CLASS.

(In Salt Water.)

Coefficient of Fineness.			PERCENTAGE RESERVE BUOYANCY. (Iron Vessels.)				
			28·7	28·9	29·1	29·3	29·5
			CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.				
			Measured from Top of Deck at Side.				
Wood.	Composite.	Iron.	Moulded Depth and Length.				
			ft. in. 22 0	ft. in. 22 6	ft. in. 23 0	ft. in. 23 6	ft. in. 24 0
			ft. 220	ft. 225	ft. 230	ft. 235	ft. 240
—	—	·64	ft. in. 4 4	ft. in. 4 6	ft. in. 4 7½	ft. in. 4 9½	ft. in. 4 11½
—	·64	·66	4 5	4 7	4 8½	4 10	5 0
—	·66	·68	4 5½	4 7½	4 9	4 11	5 1
·64	·68	·70	4 6	4 8	4 9½	4 11½	5 1½
·66	·70	·72	4 7	4 9	4 10½	5 0½	5 2½
·68	·72	·74	4 7½	4 9½	4 11	5 1	5 3
·70	·74	—	4 8½	4 10½	5 0	5 2	5 4
·72	—	—	4 9	4 11	5 1	5 3	5 5
Correction in inches for a change of 10 ft. in the length.			1·2	1·2	1·3	1·3	1·3
Addition in inches for Winter. North Atlantic.			4½	4½	4½	4½	4½

The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern Ports in the United States, north of, and including Baltimore, from October to March inclusive.

TABLE D.—*continued.*

SAILING VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-GOING IRON AND STEEL SAILING VESSELS AND COMPOSITE AND WOOD VESSELS OF THE HIGHEST CLASS.

(In Salt Water.)

Coefficient of Fineness.			PERCENTAGE RESERVE BUOYANCY.					
			(Iron Vessels.)					
			29·7	29·9	30·1	30·3	30·5	30·7
			CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS. Measured from Top of Deck at Side.					
Wood.	Composite.	Iron.	Moulded Depth and Length.					
			ft. in. 24 6	ft. in. 25 0	ft. in. 25 6	ft. in. 26 0	ft. in. 26 6	ft. in. 27 0
			ft. 245	ft. 250	ft. 255	ft. 260	ft. 265	ft. 270
—	—	·64	ft. in. 5 1½	ft. in. 5 3½	ft. in. 5 5½	ft. in. 5 7½	ft. in. 5 9½	ft. in. 5 11½
—	·64	·66	5 2	5 4	5 6	5 8	5 10	6 0½
—	·66	·68	5 3	5 5	5 7	5 9	5 11	6 1½
·64	·68	·70	5 3½	5 5½	5 7½	5 9½	5 11½	6 2
·66	·70	·72	5 4½	5 6½	5 8½	5 10½	6 0½	6 3
·68	·72	·74	5 5	5 7	5 9	5 11	6 1	6 3½
·70	·74	—	5 6	5 8	5 10	6 0	6 2	6 4½
·72	—	—	5 7	5 9	5 11	6 1	6 3	6 5½
Correction in inches for a change of 10 ft. in the length.			1·3	1·3	1·3	1·3	1·3	1·4
Addition in inches for Winter. North Atlantic.			5	5	5	5	5	5½

The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean or any British or European Port, and which may sail to, or from, or call at Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive.

TABLE D.—*continued.*

SAILING VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS
SEA-GOING IRON AND STEEL SAILING VESSELS.

(In Salt Water.)

Coefficient of Fineness.	PERCENTAGE RESERVE BUOYANCY.			
	30·9	31·2	31·4	31·7
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS. Measured from Top of Deck at Side.			
Iron.	Moulded Depth and Length.			
	ft. in. 27 6	ft. in. 28 0	ft. in. 28 6	ft. in. 29 0
	ft. 275	ft. 280	ft. 285	ft. 290
·64	ft. in. 6 1½	ft. in. 6 4	ft. in. 6 6	ft. in. 6 8
·66	6 2½	6 5	6 7	6 9
·68	6 3½	6 5½	6 8	6 10
·70	6 4	6 6½	6 8½	6 11
·72	6 5	6 7½	6 9½	7 0
·74	6 5½	6 8	6 10	7 0½
·76	6 6½	6 9	6 11	7 1½
Correction in inches for a change of 10 ft. in the length.	1·4	1·4	1·4	1·4
Addition in inches for Winter. North Atlantic.	5½	5½	5½	5½

The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive.

TABLE D.—*continued.*

SAILING VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS
SEA-GOING IRON AND STEEL SAILING VESSELS.

(In Salt Water.)

Coefficient of Fineness.	PERCENTAGE RESERVE BUOYANCY.			
	32.0	32.3	32.6	33.0
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS. Measured from Top of Deck at Side.			
Iron.	Moulded Depth and Length.			
	ft. in. 29 6	ft. in. 30 0	ft. in. 30 6	ft. in. 31 0
	ft. 295	ft. 300	ft. 305	ft. 310
	ft. in.	ft. in.	ft. in.	ft. in.
·64	6 10½	7 0½	7 3	7 5
·66	6 11½	7 1½	7 4	7 6
·68	7 0½	7 2½	7 5	7 7
·70	7 1	7 3½	7 5½	7 8
·72	7 2	7 4½	7 6½	7 9
·74	7 2½	7 5	7 7	7 9½
·76	7 3½	7 6	7 8	7 10½
Correction in inches for a change of 10 ft. in the length.	1.4	1.5	1.5	1.5
Addition in inches for Winter. North Atlantic.	6	6	6	6

The additional freeboard specified for the North Atlantic trades is to apply to vessels sailing to, or from, the Mediterranean or any British or European Port, and which may sail to, or from, or call at, Ports in British North America, or eastern Ports in the United States, north of and including Baltimore, from October to March inclusive.

LL. 12.

This Memorandum supersedes Memorandum (LL. 12), dated August, 1890, which is cancelled.

THE MERCHANT SHIPPING ACT, 1890.

MEMORANDUM

OF

Explanatory Notes on the Application of the Tables of Freeboard, drawn up with a view to securing Uniformity of Practice on the part of those entrusted with the Assignment of Freeboard under the Load Line Act of 1890, and amended on October 6th, 1892, by a Committee appointed for that purpose by the President of the Board of Trade.

Deck-Line.—In the case of vessels with uncovered iron or steel decks, a width of gutter waterway is to be assumed, and the point so obtained levelled out to the vessel's side. In the case of vessels of 24 feet beam and under, the width of the waterway assumed should be 12 inches, and in vessels of 42 feet and above, 21 inches. In vessels of between 24 and 42 feet beam the width of the gutter waterway is to be taken as half an inch for every foot in beam.

Where a wood deck maintains a uniform thickness to the sides of a vessel, the same method should be adopted.

In cases where an iron deck is partly covered with wood, the deck-line is to correspond with the top of the deck amidships, whether the deck at that part be of wood or of iron, and the necessary corrections should be made in accordance with sub-paragraph (b), page 3, as also the correction always required to the statutory deck-line.

Bridge-houses in Spar-decked Ships.—In a spar-decked ship, where an efficient bridge-house is fitted amidships, covering the engine and boiler openings, if it extends over at least two-fifths of the vessel's length, and has scantlings equal to the requirements of Lloyd's Register for bridge-houses, it is to be taken into consideration in estimating the strength of the vessel for freeboard.

The allowance on this account should not in any case exceed that given in the following table :—

Moulded depth of Vessel to Main deck.				Allowance.
				Inches.
16 feet	...	...	...	4
20 "	...	...	...	3
24 "	...	...	...	2
28 "	...	...	...	1

Tables of Freeboard.—Additional Freeboard will be required in the case of vessels classed 90 A and 80 A, or in vessels of equivalent strength thereto in accordance with the following scale :—

Length of vessel—

Feet.	150.	175.	200.	225.	250.	275.	300.
	Inch.	Inch.	Inches.	Inches.	Inches.	Inches.	Inches.
90 A Additions ...	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$	1	$1\frac{1}{4}$
80 A ,, ...	1	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2	$2\frac{1}{2}$

Wherever in these explanatory notes reference is made to classes of vessels of Lloyd's various types, it is to be understood that these apply equally to all other vessels of equivalent strength, whether classed by other classifying associations such, for instance, as the Bureau Veritas or the British Corporation or unclassified.

Para. 1. Length.—The length of erections is to be measured with reference to the length of the vessel on the load-line, *i.e.*, any portion of the erections forward of the fore side of the stem on the load-line, or abaft the after side of the after post on the load-line is not to be measured for deductions.

Para. 3. Depth of Hold.—The depth of hold as used in the computation for ascertaining the coefficient of fineness in iron and steel sailing vessels is to be measured to the top of the ceiling, and in steam vessels to the top of the floors.

Para. 4. Coefficient of Fineness.—No alteration is to be made in the freeboard in consequence of the coefficient of fineness being either smaller or greater than those given on the page of the tables from which the ship's freeboard is taken.

Para. 5. Moulded Depth.—In cases where a wood deck of extra thickness is fitted, or where a wood deck is doubled throughout, the moulded depth should be increased by the excess of thickness. The freeboard should then be set off from the top of the deck of increased thickness at the side of the vessel.

Para. 6. Freeboard.—In case of the freeboard being ascertained by an actual calculation of the reserve buoyancy, the drawing used in such calculation should be verified by actual measurements at the ship, and such drawing and calculations forwarded to the Board of Trade, and whatever the result of the calculation the freeboard assigned should not be less than would be obtained by taking from the tables the freeboard corresponding to the smallest coefficient for a vessel of the same moulded depth, except in sailing vessels with large rise of floor (see page 67).

Freeboard as ascertained by these tables is to be measured to the intersection of the deck with the side of the vessel, but in granting certificates of freeboard this must always be corrected so as to state the freeboard amidships when measured to the deck-line, marked in accordance with the statute.

Sub-para. (a.) and (b.)—For vessels having iron upper decks not covered with wood, the allowance is to be made under sub-para. (a.), when the erections extend over less than $\frac{1}{10}$ ths of the length; but in all vessels when the erections cover $\frac{1}{10}$ ths or more of the length, and in spar and awning decked vessels the allowance is to be made under sub-para. (b.)

Sub-para. (b.)—(b.) In spar-decked vessels having iron spar decks, and in awning-decked vessels having iron main decks, the freeboard by the tables should be calculated as if those decks were wood covered, *i.e.*, the ordinary thickness of a wood deck, less the thickness of the stringer plate, should be deducted from the freeboard, also in vessels where $\frac{1}{10}$ ths or more of the main deck is covered by substantial enclosed erections, the freeboard found from the tables should be measured amidships from a wood deck; or, if the deck is of iron, it should be measured from the iron deck, and the ordinary thickness of a wood deck required for that size of ship, less the thickness of the stringer plate, should in that case be deducted from the freeboard. In vessels which have $\frac{1}{10}$ ths of the deck covered, $\frac{1}{10}$ ths the thickness of a wood deck, less the thickness of the stringer plate, is to be deducted from the freeboard. Between $\frac{1}{10}$ ths and $\frac{1}{5}$ ths a proportionate quantity; for example, for $\frac{3}{10}$ ths covered allow $\frac{3}{10}$ ths the thickness of the deck, after deducting the thickness of the stringer plate. The remainder

of the paragraph should be read as printed. N.B.—When the deductions referred to in this sub-para. (b.) are allowed, the moulded depth is not to be reduced as per sub-para. (a.), para. 6.

Para. 9. If the erections are at all under $\frac{1}{8}$ ths of the vessel's length, the entire correction for length as given in the tables is to be applied.

Para. 11. This paragraph does not apply to vessels where the erections cover less than $\frac{1}{8}$ ths of the length, except in cases where the after erection covers at least $\frac{1}{8}$ ths of the length, and the total length covered is between $\frac{1}{8}$ ths and $\frac{3}{8}$ ths the length of the vessel. In such cases the allowance should be proportioned between that allowed for erections $\frac{1}{8}$ ths the length under para. 14 and that allowed for erections covering $\frac{3}{8}$ ths of the length under para. 11, and the corrections for length and sheer should be included in estimating this allowance. In all other cases of vessels with erections covering $\frac{3}{8}$ ths of the length, para. 14 is to be used.

No allowance is to be made for a monkey forecastle which is less in height than the main or top-gallant rail; where this condition is satisfied, the length to be used in estimating the allowance is to be obtained by multiplying the length of the monkey forecastle by its height and dividing by 6 feet, the minimum height of a top-gallant forecastle. This rule applies to vessels coming under paras. 12, 13, and 14, as well as under para. 11. In case of vessels having no forecastle, but in other respects coming under this para., the allowance for erections should be estimated on the supposition that there is a forecastle of $\frac{1}{8}$ th the length of the vessel, deducting from this twice the allowance which the vessel would have for such a forecastle under para. 15.

In strong well-decked vessels of the modern type, having erections covering at least $\frac{1}{10}$ ths of the length of the ship, the bridge-house alone covering at least $\frac{1}{8}$ ths of the length, the maximum allowances for extra strengthening are as follows:—

Vessels with plating number under 18,000, $2\frac{1}{2}$ inches.

Vessels with plating number 18,000 to 21,000, 3 inches.

Vessels with plating number 21,000 to 24,000, $3\frac{1}{2}$ inches.

Vessels with plating number 24,000 to 27,000, $3\frac{1}{2}$ inches.

The extra strength is to be as given in section 44, Lloyd's Rules for 1889 for iron and steel vessels. The freeboards assigned to these vessels must never be less than would be assigned for a complete awning-deck vessel of the same dimensions. The allowance prescribed below for well-decked vessels with strengthened bridge bulkheads is not to be given in addition to the allowance under this clause.

In part awning-deck vessels with raised quarter-decks and long superstructures strengthened as required for the strong well-decked vessel referred to above, a reduction may be made from the freeboard required by Table C, in accordance with the foregoing scale.

For raised quarter-decks of less than 4 feet in height, whether in part awning-decked vessels or vessels to which paras. 11 and 12 apply, and extending over $\frac{1}{10}$ ths of the lengths and forming an integral portion of the vessel, the allowance for the erections should be diminished, as shown in the following table :—

Height of raised Quarter-Deck.	Moulded Depth of Vessel in Feet.						
	ft. in. 10 0	ft. in. 12 0	ft. in. 14 0	ft. in. 16 0	ft. in. 18 0	ft. in. 20 0	ft. in. 22 0
ft. in.	in.	in.	in.	in.	in.	in.	in.
3 6	—	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$
3 0	$\frac{1}{2}$	$\frac{3}{4}$	1	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$
2 6	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2	$2\frac{1}{2}$	3
2 0	$1\frac{1}{2}$	$1\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{3}{4}$	$3\frac{1}{4}$	$3\frac{3}{4}$	$4\frac{1}{2}$
1 6	2	$2\frac{1}{2}$	3	$3\frac{3}{4}$	$4\frac{1}{4}$	5	6

For shorter lengths of raised quarter-decks a proportionate correction should be made.

Well-decked vessels classed 100 A, having erections extending over $\frac{1}{10}$ ths of their length with strengthened bridge bulkheads, freeing port area 25 per cent. in excess of the rule, and hatchway coamings at least 30 inches high, may have an allowance of $\frac{1}{10}$ th the summer freeboard after all other corrections are made, but the allowance is not to exceed 2 inches.

Vessels of lower class, or with longer wells, &c., are to have a smaller allowance in proportion.

Sub-para. (a).—The difference will not be affected by correction for length, as the allowance will be practically the same in both tables.

A proportionate allowance may be made for erections having a combined length of $\frac{1}{10}$ ths, in which case the reduction in freeboard will be $\frac{1}{10}$ ths of the difference between freeboards in Table A (after correction for sheer) and Table C.

Sub-para. (c).—The engine and boiler openings, if protected only by a raised quarter-deck, will require an addition in freeboard varying from 1 inch in vessels of 15 feet moulded depth to 2 inches in vessels of 20 feet moulded depth.

If with a small bridge-house in front of, but not covering, the openings, an addition of half the above amount.

The table is to be used in connection with paras. 11, 12, and 13, but is not applicable to deck erections provided for by para. 14.

Sub-para. (e).—If the crew are not berthed in the bridge-house, and the arrangements to enable them to get backwards and forwards from their quarters are not satisfactory, an addition should be made to the freeboard of 1 per cent. of the moulded depth of the ship, except in cases where the well is 80 feet or more in length, or where the vessels are under 150 feet in length.

Sub-para. (f).—The minimum freeing port area is to be as follows:

SCALE OF FREEING PORT AREA.

Length of Bulwarks in "Well," in Feet.	Freeing Port Area on each side in Square Feet.
30	9·5
35	10·
40	10·5
45	11·
50	11·5
55	12·
60	12·5

65 and above, 1 square foot to each 5 feet length of bulwark.

If the freeing port area is less than that stated above, an addition is to be made to the freeboard of 1 per cent. of the moulded depth.

The additional freeboard for North Atlantic winter is to be as follows:—

ADDITIONAL FREEBOARD FOR WINTER, NORTH ATLANTIC,
FOR WELL-DECK VESSELS.

Length of Vessel.	Proportion of Length of Vessel over which Erections extend.				
	$\frac{60}{100}$ ths.	$\frac{65}{100}$ ths.	$\frac{70}{100}$ ths.	$\frac{75}{100}$ ths.	$\frac{80}{100}$ ths.
Feet.	Inches.	Inches.	Inches.	Inches.	Inches.
180	5	4	$3\frac{1}{2}$	3	3
220	6	5	4	$3\frac{1}{2}$	3
260	7	6	5	$4\frac{1}{2}$	4
300	8	7	6	5	$4\frac{1}{2}$

but the above addition should never be less than in the case of an awning-decked ship of the same dimensions.

Para. 12.—For vessels having no forecastle, but with the other deck erections prescribed in this paragraph, estimate the allowance for erections supposing there is a forecastle $\frac{1}{8}$ th the length of the vessel, and deduct $1\frac{1}{2}$ times the allowance that would be made under para. 15 if the vessel were fitted with such a forecastle only.

This rule also applies to vessels having no forecastle, but with a bridge-house, as provided for in para. 13.

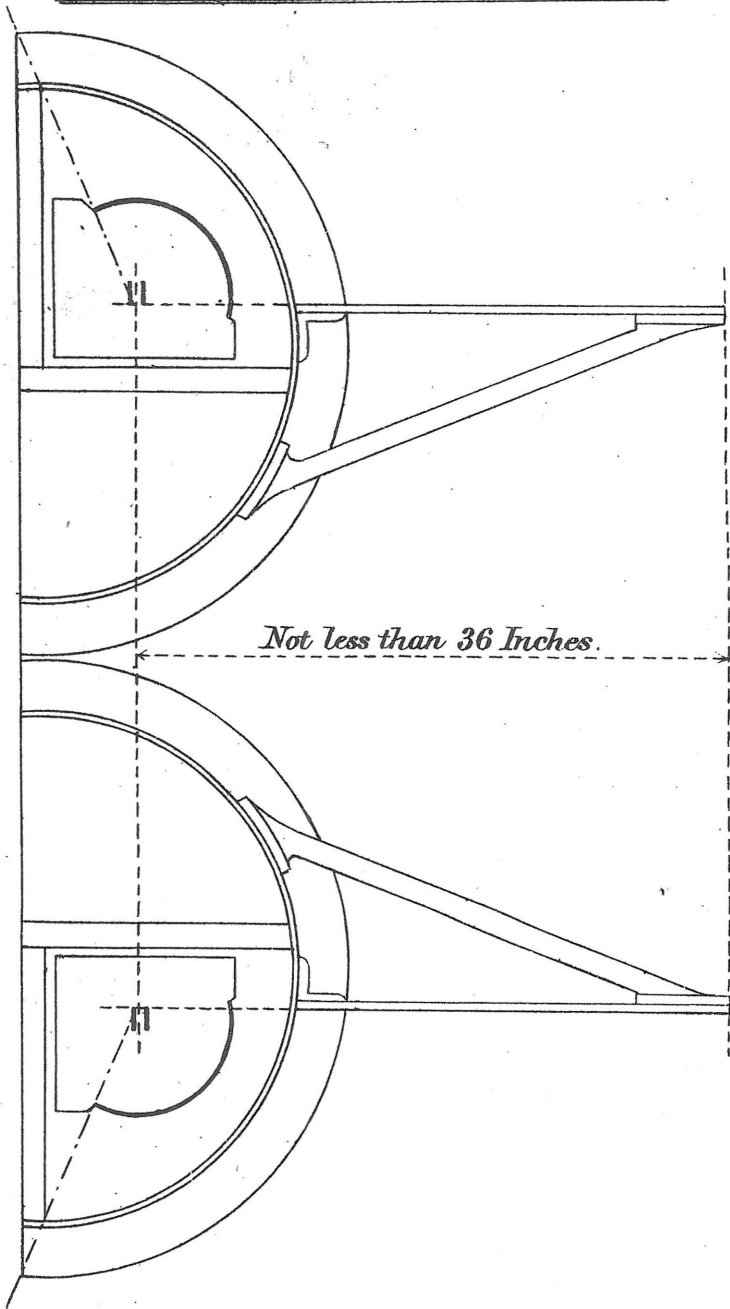
The maximum length of erections for which deductions are to be made is $\frac{80}{100}$ ths, for which allow a deduction of $\frac{70}{100}$ ths, the difference of the freeboards.

For $\frac{70}{100}$ ths allow a deduction of $\frac{60}{100}$ ths, and for $\frac{60}{100}$ ths allow $\frac{50}{100}$ ths, the difference of the freeboards.

For erections which extend over less than $\frac{60}{100}$ ths the length of the ship, the allowance is to be in proportion.

For instance, if $\frac{30}{100}$ ths are covered, allow $\frac{3}{4}$ ths of 33 per cent.

SCREENING OF SIDE LIGHTS IN TOWERS.



In the case of vessels under 15 feet moulded depth, sub-*paras.* (e) and (f) of the preceding paragraph are to apply.

Paras. 12 and 13.—The allowance in a sailing ship for a bridge-house in addition to a poop or forecastle, or in addition to a fore-castle only, is obtained by the rules laid down in *paras. 12 and 13*, as the case may be, and is calculated upon the difference between the freeboards of *Tables A and C*; in other words, the allowance for a fore-castle, bridge-house, and poop, or for a fore-castle, bridge-house, and poop, or for a fore-castle and bridge-house in a sailing ship, is the same as would be given for similar erections in a steamer of the same dimensions.

Para. 13.—When the combined length of the topgallant fore-castle and bridge-house is $\frac{1}{10}$ ths of the length of the ship, a deduction from the freeboard may be made of $\frac{3}{100}$ ths, and this is the maximum deduction for this type of vessel.

For erections which extend over less than $\frac{1}{10}$ ths of the length of the ship the allowance is to be in proportion.

For instance, $\frac{1}{10}$ ths covered allow $\frac{2}{3}$ rds of 25 per cent.

In all the rules governing the deductions to be made from the freeboard it is to be understood as follows:—When the topgallant fore-castle is not closed by an efficient bulkhead at the after end the length is never to be estimated at a greater full value than $\frac{1}{3}$ th the length of the ship, but any extension beyond this may be estimated at one-half the value. For instance, if a vessel 240 feet long has an open fore-castle 80 feet long, its value for deductions is $30 + 25 = 55$ feet. When the topgallant fore-castle has an efficient bulkhead with an elongation abaft that bulkhead not enclosed at the after end, the full value of the closed-in portion is to be estimated either as $\frac{1}{3}$ th the length of the ship, or the entire length of the enclosed portion, whichever may be the greatest.

Open bridge-houses.—When the bridge-house extends from side to side of the ship its value for deductions must be considered on its merits, which will depend upon the security of all deck openings, doors, bunker lids, or otherwise.

Where these are all properly protected and the alley-ways are open at both ends, one-half the length may be estimated as the value for deductions. Where in addition the fore end is enclosed by an efficient bulkhead, $\frac{3}{4}$ ths the length may be estimated as the value for deductions.

Bridge-houses in steamers not covering engines and boilers may have an allowance not exceeding that which would be given for half the length of a bridge-house of the same character covering engines and boilers.

Para. 14.—In the case of a vessel having a fore-castle and raised quarter-deck, the latter of less than the usual height, the

length of raised quarter-deck to be allowed should be in proportion to its height as compared with the standard height. Thus $\frac{L \times H}{4}$ = length allowed if the height is less than 4 feet.

When the combined length of the erections is $\frac{1}{4}$ th of the length of the vessel, deduct 10 per cent. of the reserve buoyancy or 12 per cent. of the freeboard required for the flush-decked vessel after correction for length.

When $\frac{1}{8}$ th of the length of the vessel, deduct 4 per cent. of the reserve buoyancy or 6 per cent. of the freeboard required for the flush-decked vessel after correction for length. In cases where less than $\frac{1}{8}$ th of the length of the vessel is covered by erections the allowance should be in proportion to that given for erections covering $\frac{1}{8}$ th of the length.

Para. 15.—When there is a poop only, the allowance is to be half of that which in this paragraph is given for a forecastle only of the same length. This is also applicable to a raised quarter-deck, subject to the modifications in the preceding note.

When the poop has no bulkhead, or the bulkhead does not extend across the vessel, one-half its length may be allowed, provided always proper freeing ports are fitted.

Para. 16. Sheer.—Sheer of a gradual character is to be defined as follows:—

At $\frac{1}{8}$ th the length of the vessel from the stem or sternpost the sheer is to be 55 per cent. of the sheer at stem or sternpost; at $\frac{1}{4}$ th the length from stem or sternpost 26 per cent., and at $\frac{3}{8}$ ths the length 7 per cent. In cases where there is no forecastle the sheer is to be measured at the stem and sternpost, and corrections made for it in all respects as in the case of flush-decked vessels.

When the bridge-house is enclosed, the sheer should be taken at the ends and the freeboard corrected for sheer in estimating the allowance for erections. When the bridge-house is not enclosed at both ends, the sheer should be measured at $\frac{1}{8}$ th the length of the vessel, from the stem or sternpost, and the freeboard should not be corrected for sheer in estimating the allowance for erections.

Sub-para. (a).—Surveyors should note that clauses 11 and 12 apply either to vessels of the ordinary well-decked type or to vessels having a poop and forecastle with a disconnected bridge-house.

Sub-para. (f).—In flush-deck vessels the total standard mean sheer means the sheer measured at the stem and sternpost. In vessels having poops and forecastles, it means the sheer measured at points distant $\frac{1}{8}$ th of the vessel's length from stem and sternpost.

In vessels obtaining an allowance for deck erections under para. 11, where the sheer drops abaft amidships, the height of the raised quarter-deck is to be taken from the level of the top of the midship beam.

In applying the rule given in para. 16 (*d*), the extent of the depressed part of the sheer covered by deck erections is to be allowed for.

TABLE A.

The deductions for summer in vessels having deck erections is to be intermediate between those required by Tables A and C in proportion to the length of the ship covered by those erections.

In the case of small vessels, in Table A, the addition to the freeboard for North Atlantic winter will have to be specially considered, but is never to be less than 3 inches.

TABLE B.

All vessels equal in strength to Lloyd's spar-decked rule, or which, although in excess of that rule, do not come up to Lloyd's requirements for ships of full scantlings to the upper deck are to be considered as spar-decked ships, the freeboard for which will vary with their strength.

When the height between decks is greater or less than 7 feet, the consequent modification in freeboard will vary from $\frac{1}{3}$ rd to $\frac{2}{3}$ rds the excess or deficiency of height, the exact proportion to depend upon the strength of the vessel.

In spar-decked vessels where the height between main and spar decks exceeds 7 feet, the numbers for scantlings should be found assuming the height between decks to be 7 feet; if both these numbers are in the same grades as the actual scantling numbers of the vessel, the correction for height between decks is to be $\frac{1}{3}$ rd of the excess of height above 7 feet. If both the scantling numbers so found are in higher grades than those of the actual vessel, $\frac{2}{3}$ rds of the excess of height is to be added, and if either one of these scantling numbers is in a higher grade, $\frac{1}{2}$ of the excess of height is to be added. The same principle will apply in cases where the height between decks is less than 7 feet.

Since the freeboard is measured from the spar deck, it will be increased if the 'tween deck height is more, and decreased if it is less, than 7 feet.

In computing the freeboard of spar-decked vessels having scantlings in excess of Lloyd's requirements, a comparison is to be made between their scantlings, the scantlings of vessels of the same dimensions classed 100A built to the three-decked rule, and of vessels built to the 100A spar-decked rule, and the freeboard is to be proportionate between that given in Table A and that given in Table B, after deducting 12 per cent. from the former; but in no case must the freeboard so assigned be less than that provided in Table A for a vessel of the same dimensions, sheer, and camber, or round of beam.

In the comparison of scantlings and assignment of freeboard to spar-decked vessels having scantlings in excess of Lloyd's requirements, the following method is to be adopted :—

1. The difference between the freeboard by Table A (less 12 per cent.) and that by Table B to be divided by five, $\frac{2}{3}$ ths of it being considered with reference to the longitudinal strength, and $\frac{1}{3}$ ths of it with reference to the transverse strength, these allowances to be the maximum deduction on each account.

2. In the comparison of steel ships, notwithstanding the general reduction of 20 per cent. for steel, as compared with iron thicknesses, outside plating in the way of the double bottom is not to be further reduced by $\frac{1}{20}$ th unless its thickness is $\frac{1}{2}$ ths or over. No reduction is to be made in any case unless there are floors connected with every frame.

3. In the calculation of strength, the following method is to be adopted :—

- (a.) Thin iron or steel plating in decks and the inner plating of double bottoms are to have their sectional area reduced for the purpose of the strength calculation as follows :—

Thickness in 16ths or 20ths...	5	6	7	8	9
Multiplier	·4	·6	·7	·9	1

- (b.) A deduction of $\frac{1}{4}$ th is to be made for rivet holes in steel, and $\frac{1}{8}$ th in iron for the parts in tension.
- (c.) Iron or steel decks which cover not less than $\frac{2}{3}$ ths of the midship length of the vessel are to be considered in the calculation just as they would be if of the full length.
- (d.) Wood weather decks, if continuous throughout the midship portion of the ship, are to be considered as equivalent to steel of $\frac{1}{2}$ th the sectional area of the wood.
- (e.) For the purpose of comparison of strength, the breadth of the hatchways in the standard vessel shall be deemed to be $\frac{1}{3}$ rd the breadth of the deck, and the tie-plates should be assumed to be fitted at the side of the hatchways.

TABLE C.

All vessels equal in strength to Lloyd's awning-decked rule, or which, although in excess of that rule, do not come up to Lloyd's requirements for a spar-decked vessel, are to be considered as awning-decked vessels, the freeboard of which will vary with their strength.

No modification is necessary in respect of the height of 'tween decks of awning-decked vessels.

In computing the freeboard for awning-decked vessels having scantlings in excess of Lloyd's requirements, a comparison is to

be made between their scantlings, the scantlings of vessels of the same dimensions built to the 100A spar-decked rule, and of vessels built to the 100A awning-decked rule, and the freeboard is to be proportionate between that given in Table B and that given in Table C.

In vessels where the superstructure is of less strength than that required for the 100A awning-decked class, additions are to be made to the freeboard in the same proportion.

The freeboard of awning-decked vessels of the highest class of less than 14 feet moulded depth is to be arrived at as follows :—

Ascertain the freeboard by Table A for a vessel of the same moulded depth to main deck, and to reduce this by $\frac{1}{12}$ th the moulded depth, the result is the freeboard for awning-decked vessel. The correction for length is to be $\frac{1}{10}$ ths of an inch for 10 feet, and the deduction for summer voyages 2 inches, and the addition for North Atlantic winter 3 inches.

In the comparison of scantlings and assignment of freeboard to awning-deck vessels having scantlings in excess of Lloyd's requirements, the method of procedure to be similar to that stated above for spar-decked vessels having scantlings in excess of those provided by the spar-decked rule.

TABLE D.

Sailing vessels classed A (black) in Lloyd's Register are to be regarded as first-class ships in applying the tables.

Hard wood ships, *i.e.*, other than fir or pine, classed A (red) in Lloyd's are to have their freeboards by the tables increased by 8 per cent.

Hard wood ships classed \mathcal{A} E in Lloyd's are to have their freeboards by the tables increased 15 per cent.

Hard wood ships without class are to have their freeboards by the tables increased by 20 per cent., unless opened out for survey, when their freeboards will depend upon their condition.

Soft wood ships will require to have their coefficient of fineness modified in respect of the excess of the registered breadth caused by the extra thickness of side. That for hard wood ships is already provided for in the tables.

Soft wood ships classed A (red) in Lloyd's are to have their freeboards by the tables increased 10 per cent.

Soft wood ships classed \mathcal{A} E in Lloyd's are to have their freeboards increased 20 per cent.

Soft wood ships without class are to have their freeboards by the tables increased 25 per cent., unless opened out for survey, when their freeboards will depend upon their condition.

Iron and steel sailing vessels having a greater rate of rise of floor than $1\frac{1}{2}$ inches per foot of half breadth, may have the moulded depth to be used with the tables reduced by half the

difference between the total rise of floor at the half breadth and the total rise at the standard rate of $1\frac{1}{2}$ inches per foot; $2\frac{1}{2}$ inches per foot of half breadth is to be the maximum rate of rise on which an allowance is to be made. When the reserve buoyancy is calculated, the percentage taken shall be that corresponding to the depth reduced as above, but in no case shall the freeboard be less than that given in the top line of Table D for such percentage. Whichever method be adopted the correction for length is to be applied in relation to the reduced moulded depth.

Extensions of Tables A, B, and D downwards are given as follows. They apply to smaller vessels than those provided for in the load-line tables.

TABLE A.—CARGO-CARRYING STEAM VESSELS NOT HAVING SPAR OR AWNING DECKS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-GOING IRON AND STEEL STEAM VESSELS. (In Salt Water.)

Coefficient of Fineness.	PERCENTAGE RESERVE BUOYANCY.—(<i>Winter.</i>)							
	20·4	20·6	20·8	21·0	21·2	21·4	21·6	21·8
	CORRESPONDING HEIGHT OF FREEBOARD AMIDSHIPS.— (<i>Winter.</i>) Measured from Top of Deck at Side.							
	Moulded Depth and Length.							
	ft. in. 6 0	ft. in. 6 6	ft. in. 7 0	ft. in. 7 6	ft. in. 8 0	ft. in. 8 6	ft. in. 9 0	ft. in. 9 6
	72 0	78 0	84 0	90 0	96 0	102 0	108 0	114 0
·68	0 8	0 9	0 10	0 11	1 0	1 1	1 2	1 3
·70	0 8	0 9	0 10	0 11	1 0	1 1	1 2	1 3
·72	0 8½	0 9½	0 10½	0 11½	1 0½	1 1½	1 2½	1 3½
·74	0 8½	0 9½	0 10½	0 11½	1 0½	1 1½	1 2½	1 3½
·76	0 9	0 10	0 11	1 0	1 1	1 2	1 3	1 4
·78	0 9	0 10	0 11	1 0	1 1	1 2	1 3	1 4
·80	0 9½	0 10½	0 11½	1 0½	1 1½	1 2½	1 3½	1 4½
·82	0 9½	0 10½	0 11½	1 0½	1 1½	1 2½	1 3½	1 4½
Correction in inches for a change of 10 ft. in the length.	0·7	0·7	0·8	0·8	0·8	0·8	0·8	0·8
Deduction in inches for summer voyages.	1	1	1	1	1	1	1	1

TABLE B.

CARGO-CARRYING SPAR-DECK VESSELS.

TABLE OF FREEBOARD TO SPAR-DECK FOR FIRST-CLASS SEA-GOING
SPAR-DECK STEAM VESSELS.

(In Salt Water.)

Coefficient of Fineness.	Height of Freeboard amidships (Winter) measured from top of Spar Deck at Side.					
	Moulded Depth (to Main Deck) and Length.					
	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
	13 0	13 6	14 0	14 6	15 0	15 6
	240 0	246 0	252 0	258 0	264 0	270 0
·68	5 5	5 6	5 7	5 8	5 9	5 10
·70	5 5½	5 6½	5 7½	5 8½	5 9½	5 10½
·72	5 6	5 7	5 8	5 9	5 10	5 11
·74	5 6½	5 7½	5 8½	5 9½	5 10½	5 11½
·76	5 7	5 8	5 9	5 10	5 11	6 0
·78	5 7½	5 8½	5 9½	5 10½	5 11½	6 0½
·80	5 8	5 9	5 10	5 11	6 0	6 1
·82	5 8½	5 9½	5 10½	5 11½	6 0½	6 1½
Correction in inches for a change of 10 ft. in the length.	·9	·9	·9	·9	·9	·9
Deduction in inches for summer voyages.	2	2	2	2	2½	2½
Addition in inches for winter, North Atlan- tic.	3	3	3	3	3½	3½

TABLE D.
SAILING VESSELS.

TABLE OF RESERVE BUOYANCY AND FREEBOARD FOR FIRST-CLASS SEA-GOING IRON AND STEEL SAILING VESSELS AND COMPOSITE AND WOOD VESSELS OF THE HIGHEST CLASS.

(In Salt Water.)

Coefficient of Fineness.			PERCENTAGE RESERVE BUOYANCY. (Iron Vessels.)																	
			21.7	21.9	22.1	22.3	22.5	22.7	22.9	23.1	23.3									
			CORRESPONDING HEIGHT OF FREEBOARD. Measured from top of Deck at Side.																	
Wood.	Compo- site.	Iron.	Moulded Depth and Length.																	
			ft. in.		ft. in.		ft. in.		ft. in.		ft. in.		ft. in.		ft. in.					
			5	6	6	0	6	6	7	0	7	6	8	0	8	6	9	0	9	6
			55	0.	60	0	65	0	70	0	75	0	80	0	85	0	90	0	95	0
—	—	.64	0	8½	0	9½	0	10½	0	11½	1	0½	1	1½	1	2½	1	3½	1	4½
—	.64	.66	0	8½	0	9½	0	10½	0	11½	1	0½	1	1½	1	2½	1	3½	1	4½
—	.66	.68	0	9	0	10	0	11	1	0	1	1	1	2	1	3	1	4	1	5
.64	.68	.70	0	9	0	10	0	11	1	0	1	1	1	2	1	3	1	4	1	5
.66	.70	.72	0	9½	0	10½	0	11½	1	0½	1	1½	1	2½	1	3½	1	4½	1	5½
.68	.72	.74	0	9½	0	10½	0	11½	1	0½	1	1½	1	2½	1	3½	1	4½	1	5½
.70	.74	—	0	10	0	11	1	0	1	1	1	2	1	3	1	4	1	5	1	6
.72	—	—	0	10	0	11	1	0	1	1	1	2	1	3	1	4	1	5	1	6
Correction in inches for a change of 10 ft. in the length			0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9

BOARD OF TRADE,
November, 1892.

M 17530

1892.

Regulations as to Load-line Marks, Certificates, Draught of Water and Freeboard.

Merchant Shipping Act, 1894.

1. The circular disc shall be 12 inches in diameter with a horizontal line 18 inches in length and drawn through its centre. The disc shall be marked amidships on each side of the ship, the position of its centre being placed at such level as is specified in the Marine Board certificate of approval.

2. The lines to be used in connection with the disc in order to indicate the maximum load-line under different circumstances and at different seasons shall be horizontal lines, 9 inches in length and 1 inch in thickness, extending from and at right angles to a vertical line marked 21 inches forward of the centre of the disc.

The maximum load-lines in fresh water shall be marked abaft such vertical line, and the maximum load-lines in salt water shall be marked forward of such vertical line, as shown in the diagrams hereinafter mentioned.

3. Such maximum load-lines shall be as follows, and the upper edge of such lines shall respectively indicate :—

For Fresh Water.—The maximum depth to which the vessel can be loaded in fresh water.

For Indian Summer.—The maximum depth to which the vessel can be loaded for voyages during the fine season in the Indian seas, between the limits of Suez and Singapore.

For Summer.—The maximum depth to which the vessel can be loaded for voyages (other than Indian summer voyages) from European and Mediterranean ports between the months of April and September, both inclusive, and as to voyages in other parts of the world (other than Indian summer voyages) the maximum depth to which the vessel can be loaded during the corresponding or recognised summer months.

For Winter.—The maximum depth to which the vessel can be loaded for voyages (other than Indian summer voyages and summer voyages) from European and Mediterranean ports between the months of October and March, both inclusive, and as to voyages in other parts of the world the maximum depth to which the vessel can be loaded during the corresponding or recognised winter months.

For Winter (North Atlantic).—The maximum depth to which the vessel can be loaded for voyages to, or from, the Mediterranean, or any European port, from, or to, ports in British North America, or Eastern ports in the United States, the entrance to which from the sea, or the entrance from the sea to the estuary or river on which such ports may be situated, is north of $37^{\circ} 30'$ north latitude, between the months of October and March both inclusive.

Such maximum load-lines shall be distinguished by initial letters conspicuously marked opposite such horizontal lines as aforesaid, such initial letters being as follows :—

- F. W.—Fresh water.
- I. S.—Indian summer.
- S.—Summer.
- W.—Winter.
- W. N. A.—Winter, North Atlantic.

4. The upper edge of the horizontal line passing through the centre of the disc shall always indicate the maximum summer load-line in salt water. The relative positions of the upper edges of the other lines to be used in connection with the disc, with the upper edge of the line passing through the centre of the disc (the maximum summer load-line), will be indicated in the certificate of approval.

5. Part V of the Merchant Shipping Act, 1894, shall have effect as if the maximum load-line applicable to a particular voyage were drawn through the centre of the disc.

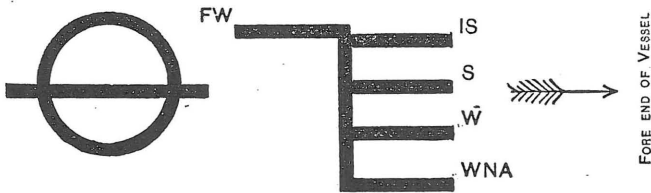
6. Steamships shall be marked on both sides with such of the horizontal lines as aforesaid as are applicable to the nature of their employment, and sailing ships shall be marked on both sides with such of the above-mentioned lines, in addition to the horizontal line passing through the centre of the disc, as indicate the maximum load-line for fresh water and for North Atlantic winter; but sailing ships engaged solely in the coasting trade shall only be marked, in addition to the horizontal line passing through the centre of the disc, with the line indicating the maximum load-line in fresh water.

7. The said disc and the said maximum load-lines in connection therewith shall be painted white or yellow on a dark ground, or black on a light ground, and the position of the disc and of each of the lines shall in the case of iron and steel vessels be permanently marked by centre punch marks, and shall in the case of wooden vessels be sunk for their breadths into the planking a depth of not less than one quarter of an inch.

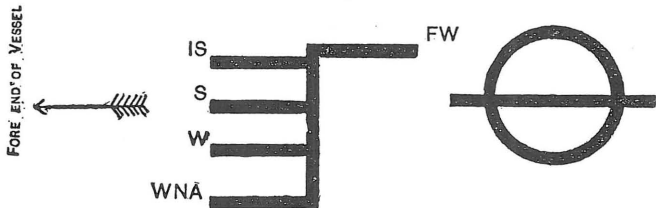
8. The position of the disc and the horizontal line passing through its centre, as also the lines to be used in connection with the disc, are shown in the following diagrams :—

FOR STEAMER

STARBOARD SIDE

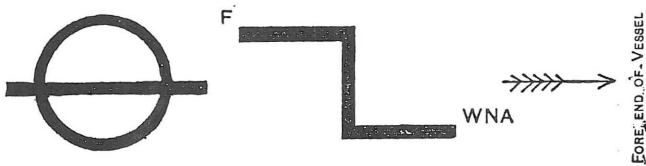


PORT SIDE

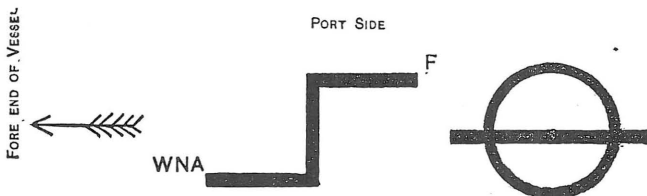


FOR SAILING SHIP.

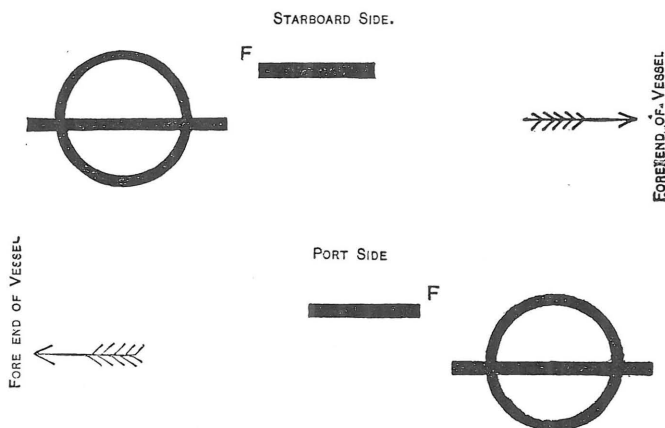
STARBOARD SIDE.



PORT SIDE



SAILING SHIPS ENGAGED IN THE COASTING TRADE.



The arrow (\Rightarrow) points in the direction of the vessel's head.

9. Application for a certificate of approval of the position of the disc and of the lines to be used in connection therewith or any alteration thereof shall be made by one of the registered owners of the ship or by the builder of the ship. Every application shall be made in the form marked L.L. 1 in the schedule hereto.

10. With respect to certificates of approval and their duration, the following rules shall prevail :—

- (a) As regards all ships classed in Lloyd's Register, or by any other corporation or association for the survey or registry of shipping approved by the Marine Board, the certificate of approval shall cease to have effect when the class of the ship is changed or withdrawn. Such certificate shall be in the form L.L. 2 or L.L. 3 in the schedule hereto according as the ship is a steamship or sailing ship.
- (b) As regards unclassified iron and steel steamships the certificate of approval will be granted for the period mentioned therein, and upon the expiration of such period the certificate shall cease to have effect. The certificate shall be in the form L.L. 2B in the schedule hereto.
- (c) As regards unclassified wooden ships which have been opened out for survey, and unclassified iron and steel sailing ships, the certificate will be granted for a fixed time varying with the age and condition of the ship, and at the expiration of such period it shall cease to have effect. Such certificate shall be in the form L.L. 3A in the schedule hereto.

- (d) As regards unclassed wooden ships which have not been opened out for survey, no limit of time will be imposed in the certificate, which shall be in the form L.L. 3B. in the schedule hereto.
- (e) As regards all vessels having deck erections in respect of which deductions have been made for freeboard, if any change tending to invalidate the right to such deductions is made in the structural condition of the deck erections, the certificate of approval shall thereby cease to have effect.

11. Every certificate of approval shall be issued in duplicate, one part shall be delivered to the applicant, and the other part shall be forthwith sent to the Secretary of the Marine Board.

12. On a certificate of approval ceasing to have effect, application shall at once be made by the registered managing owner of the ship for the granting of a new certificate of approval, and the old certificate shall be delivered up to the Marine Board, who shall cancel the same. In default of a certificate, which has ceased to have effect, being handed in for cancellation, it shall be competent for an officer of the Marine Board to notify any collector of customs that such certificate is no longer valid, and for any collector on receiving such notice to refuse clearance to the vessel in question.

13. The master of every British ship shall, before she leaves any dock, wharf, port, or harbour within the jurisdiction for the purpose of proceeding to sea, enter in the official log all the particulars stated in the certificate so issued as aforesaid if not previously entered.

14. The managing owner or master shall forthwith, on the delivery to him or his agent of any such certificate as aforesaid, cause the same to be framed and put up in some conspicuous part of the ship so as to be visible to all persons on board the same, and shall cause it to be continued so put up so long as such certificate remains in force and such ship is in use.

15. For the purpose of these regulations the expression "amidships" shall mean the middle of the length of the load water-line as measured from the fore side of the stem to the aft side of the stern post.

Dated this 22nd day of June, 1896.

SCHEDULE.

FORM L.L. 1.

APPLICATION for CERTIFICATE of APPROVAL of the POSITION of the CENTRE of the DISC and of the LINES to be used in connection therewith under the provisions of the Merchant Shipping Act, 1894.

Application is hereby made to _____ for a certificate of approval of the position (or alteration of the position) of the centre of the

disc and of the lines to be used in connection therewith on the (steamship (sailing ship) Official No. . (The vessel is classed in) (is not classed).

The vessel is (is not) intended to be employed in the Indian Ocean.

The vessel is (is not) intended to be employed in the North Atlantic trade.

No previous application has been made either by the builder or the owner for a certificate of approval of the position (or alteration of the position) of the centre of the disc on this vessel to this or any other authority appointed in accordance with section 443 of the Merchant Shipping Act, 1894 (except in respect of a previous certificate dated which has expired or ceased to have effect).

Dated this day of 18 . Registered Owner,
[Builder].

FORM L.L. 2.

CERTIFICATE of APPROVAL of the POSITION [Alteration of the Position] of the CENTRE of the DISC and of the LINES to be used in connection therewith, on the Steamship " ," Official No. , in pursuance of the Merchant Shipping Act, 1894.

The []

[], an officer of the Marine Board] have approved on behalf of the Board the position [or alteration of the position] of the centre of the disc and of the lines to be used in connection therewith on the Steamship " ," Official No. , and hereby certify—

- (a) that the centre of such disc is placed at feet inches below the deck line marked under the provisions of the Merchant Shipping Act, 1894.
- (b) that the position of the lines to be used in connection with the disc shall be as follows :—

Maximum load-line in fresh water.—The upper edge of this line is feet inches above the upper edge of the horizontal line passing through the centre of the disc.

Maximum load-line in Indian summer.—The upper edge of this line is feet inches above the upper edge of the horizontal line passing through the centre of the disc.

Maximum load-line in summer.—The upper edge of this line is on the same level as the upper edge of the horizontal line passing through the centre of the disc.

Maximum load-line in winter.—The upper edge of this line is feet inches below the upper edge of the horizontal line passing through the centre of the disc.

Maximum load-line in North Atlantic winter.—The upper edge of this line is feet inches below the upper edge of the horizontal line passing through the centre of the disc.

This certificate is to remain in force only so long as the vessel remains in her present class, provided that no change has taken place in the structural condition of those deck erections in respect of which deductions have been made for freeboard.

Dated this day of , 18 .
(Signed)

Note.—In accordance with regulations made by the Marine Board, the disc and lines must be permanently marked by centre punch marks or

cutting, and the particulars given in this certificate are to be entered in the official log. The certificate must also be framed and put up in some conspicuous part of the ship.

If and so soon as the class of the ship is either changed or withdrawn, or if and so soon as any change is made in the structural condition of the deck erections above-mentioned, this certificate will be cancelled and must be delivered to the Marine Board for that purpose, and the owner must then apply for a new certificate.

The *summer freeboard* applies to voyages from European and Mediterranean ports, from April to September inclusive. In other parts of the world this freeboard should be used during the corresponding or recognised summer months.

The *freeboard for winter, North Atlantic trades*, applies to vessels sailing to, or from, the Mediterranean, or any British or European port, and which may sail to, or from, or call at, ports in British North America, or eastern ports in the United States, the entrance to which from the sea, or the entrance from the sea to the estuary or river on which such ports may be situated is north of $37^{\circ} 30'$ north latitude, from October to March inclusive.

The *freeboard for Indian summer* applies to voyages in the fine season in the Indian seas between the limits of Suez and Singapore.

FORM L.L. 2B.

CERTIFICATE OF APPROVAL of the POSITION [Alteration of the Position] of the CENTRE of the DISC, and of the LINES to be used in connection therewith on the Steamship " " Official No. , in pursuance of the Merchant Shipping Act, 1894.

The []
[I, , an officer of the Marine Board] have approved on behalf of the Board the position [or alteration of the position] of the centre of the disc, and of the lines to be used in connection therewith on the Steamship " " Official No. , and hereby certify—

- (a) that the centre of such disc is placed at feet inches below the deck line marked under the provisions of the Merchant Shipping Act, 1894 ;
- (b) that the position of the lines to be used in connection with the disc shall be as follows :—

Maximum load-line in fresh water. The upper edge of this line is feet inches above the upper edge of the horizontal line passing through the centre of the disc.

Maximum load-line in Indian summer. The upper edge of this line is feet inches above the upper edge of the horizontal line passing through the centre of the disc.

Maximum load-line in summer. The upper edge of this line is on the same level as the upper edge of the horizontal line passing through the centre of the disc.

Maximum load-line in winter. The upper edge of this line is feet inches below the upper edge of the horizontal line passing through the centre of the disc.

Maximum load-line in North Atlantic winter. The upper edge of this line is feet inches below the upper edge of the horizontal line passing through the centre of the disc.

This certificate is to remain in force until the day of 18 .

Dated this day of 18 .
(Signed)

Note.—In accordance with regulations made by the Marine Board, the disc and lines must be permanently marked by centre punch marks or cutting, and the particulars given in this certificate are to be entered in the official log. The certificate must also be framed and put up in some conspicuous part of the ship.

On the day of 189 , or if and so soon as any change is made in the structural condition of those deck erections, in respect of which deductions have been made for freeboard, this certificate will cease to have effect, and it must be delivered to the Marine Board to be cancelled, and the owner must then apply for a new certificate.

The *summer freeboard* applies to voyages from European and Mediterranean ports from April to September inclusive. In other parts of the world this freeboard should be used during the corresponding or recognised summer months.

The *freeboard for winter, North Atlantic trades*, applies to vessels sailing to, or from, the Mediterranean, or any British or European port, and which may sail to, or from, or call at, ports in British North America, or eastern ports in the United States, the entrance to which from the sea, or the entrance from the sea to the estuary or river on which such ports may be situated, is north of 37° 30' north latitude, from October to March inclusive.

The *freeboard for Indian summer* applies to voyages in the fine season in the Indian seas between the limits of Suez and Singapore.

FORM L.L. 3.

CERTIFICATE of APPROVAL of the POSITION [alteration of the Position] of the CENTRE of the DISC, and of the LINES to be used in connection therewith on the Sailing Ship “ ,” Official No. , in pursuance of the Merchant Shipping Act, 1894.

The []].

[I, an officer of the Marine Board] have approved on behalf of the Board the position [or alteration of the position] of the centre of the disc, and of the lines to be used in connection therewith on the sailing ship “ ,” Official No. , and do hereby certify—

(a) that the centre of such disc is placed at feet inches below the deck line marked under the provisions of the Merchant Shipping Act, 1894 ;

(b) that the position of the lines to be used in connection with the disc shall be as follows :—

Maximum load-line in fresh water. The upper edge of this line is feet inches above the upper edge of the horizontal line passing through the centre of the disc.

Maximum load-line in winter North Atlantic. The upper edge of this line is feet inches below the upper edge of the horizontal line passing through the centre of the disc.

This certificate is to remain in force only so long as the vessel remains in her present class, provided that no change has taken place in the structural condition of those deck erections, in respect of which deductions have been made for freeboard.

Dated this day of , 18 .

(Signed)

Note.—In accordance with the regulations made by the Marine Board, the disc and lines must be permanently marked by centre punch marks or cutting, and the particulars given in this certificate are to be entered in the official log. This certificate must also be framed, and put up in some conspicuous part of the ship.

If and so soon as the class of the ship is either changed or withdrawn, or if and so soon as any change is made in the structural condition of the deck erections above-mentioned this certificate will be cancelled, and must be delivered to the Marine Board for that purpose, and the owner must then apply for a new certificate.

The *freeboard for winter, North Atlantic trades*, applies to vessels sailing to, or from, the Mediterranean, or any British or European port, and which may sail to, or from, or call at ports in British North America, or eastern ports in the United States, the entrance to which from the sea, or the entrance from the sea to the estuary or river on which such ports may be situated, is north of 37° 30' north latitude, from October to March inclusive.

FORM L.L. 3A.

CERTIFICATE of APPROVAL of the POSITION [alteration of the Position] of the CENTRE of the DISC, and of the LINES to be used in connection therewith on the Sailing Ship, “_____,” Official No. _____, in pursuance of the Merchant Shipping Act, 1894.

The [_____] [_____]].

[I, _____, an officer of the Marine Board] have approved, on behalf of the Board, the position [or alteration of the position] of the centre of the disc, and of the lines to be used in connection therewith on the sailing ship, “_____,” Official No. _____, and hereby certify—

- (a) that the centre of such disc is placed at _____ feet _____ inches below the _____ deck line marked under the provisions of the Merchant Shipping Act, 1894.
- (b) that the position of the lines to be used in connection with the disc shall be as follows:—

Maximum load-line in fresh water. The upper edge of the line is _____ feet _____ inches above the upper edge of the horizontal line passing through the centre of the disc.

Maximum load-line in winter, North Atlantic. The upper edge of this line is _____ feet _____ inches below the upper edge of the horizontal line passing the centre of the disc.

This certificate is to remain in force until the _____ day of _____ 18 .

Dated this _____ day of _____ 18 .
(Signed)

Note.—In accordance with the regulations made by the Marine Board, the disc and lines must be permanently marked by centre punch marks or cutting, and the particulars given in this certificate are to be entered in the official log. This certificate must also be framed and put up in some conspicuous part of the ship.

On the _____ day of _____ 189 , or if and so soon as any change is made in the structural condition of those deck erections, in respect of which deductions have been made for freeboard, this certificate will cease to have effect, and it must be delivered to the Marine Board to be cancelled, and the owner must then apply for a new certificate.

The *freeboard for winter, North Atlantic trades*, applies to vessels sailing to, or from, the Mediterranean, or any British or European port, and which may sail to, or from, or call at, ports in British North America, or eastern ports in the United States, the entrance to which from the sea or the entrance from the sea to the estuary or river on which such ports may be situated, is north of 37° 30' north latitude, from October to March inclusive.

FORM L.L. 3B.

CERTIFICATE of APPROVAL of the POSITION [Alteration of the Position] of
the CENTRE of the DISC, and of the LINES to be used in connection
therein on the Sailing Ship “ _____,” Official No. _____,
in pursuance of the Merchant Shipping Act, 1894.

[The []]
[I, [], an officer of the Marine Board] have approved,
on behalf of the Board, the position [or alteration of the position] of the
centre of the disc, and of the lines to be used in connection therewith
on the sailing ship “ [],” Official No. [], and hereby
certify—

- (a) that the centre of such disc is placed at feet inches below the deck line marked under the provisions of the Merchant Shipping Act, 1894 ;
- (b) that the position of the lines to be used in connection with the disc shall be as follows :—

Maximum load-line in fresh water. The upper edge of this line is _____ feet _____ inches above the upper edge of the horizontal line passing through the centre of the disc.

Maximum load-line in winter, North Atlantic. The upper edge of this line is feet inches below the upper edge of the horizontal line passing through the centre of the disc.

Dated this day of 189 .
(Signed)

Note.—In accordance with the regulations made by the Marine Board, the disc and lines must be permanently marked by centre punch marks or cutting, and the particulars given in this certificate are to be entered in the official log. The certificate must also be framed and put in some conspicuous part of the ship.

If and so soon as any change is made in the structural condition of those deck erections, in respect of which deductions have been made for freeboard, this certificate will be cancelled, and must be delivered to the Marine Board for that purpose, and the owner must then apply for a new certificate.

The *freeboard for winter, North Atlantic trades*, applies to vessels sailing to, or from, the Mediterranean, or any British or European port, and which may sail to, or from, or call at, ports in British North America, or eastern ports in the United States, the entrance to which from the sea, or the entrance from the sea to the estuary or river on which such ports may be situated, is north 37° 30' north latitude from October to March inclusive.

The following Rules are specially applicable for Engineer Surveyors.

Surveyors'
declarations.

141. The particulars required to be given by the Engineer Surveyors in the declaration are the following :—

- (1.) That the hull, machinery, &c., are in good order, and sufficient for the service intended.
- (2.) The time during which the declaration shall remain in force.
- (3.) The limits (if any) beyond which, as regards hull and equipments, the ship is, in the Surveyor's judgment, not fit to ply.
- (4.) The working pressure on the safety-valves.
- (5.) That the safety-valves and fire-hose are such, and in such condition, as are required by the Acts.
- (6.) In the case of a ship required by the Acts to have a certificated engineer, that the certificate or certificates of the engineer or engineers of such ship is or are such and in such a condition as is required by the Acts.

Surveyors may
go on board
ships.

142. Surveyors may go on board any ship for the purpose of inspection either of officers' certificates, or of hull and machinery, or for any other purpose in accordance with the Navigation Act ; and the officers are required to give the Surveyors all the information and assistance in their power.

In the performance of this duty they should be careful to avoid impeding the work of the vessel, or wilfully giving offence to any of the officers.

If they are opposed or obstructed in any way they should by no means mark it by personal resentment, but at once report the matter to the Board.

Survey to be
made in presence
of officers.

143. Surveyors should, if possible, make their inspections when the principal officers of the ship are present. Defects and repairs can then be pointed out to the proper persons, without incurring the uncertainty and delay consequent upon messages delivered to subordinate officers.

Statement of
repairs required
to be given by
the Surveyors.

144. To prevent mistakes as to the nature and extent of the repairs required, a written statement of the nature and extent of the defects should in all cases be given to the owner, agent, captain, or chief engineer, whether applied for or not.

A copy of the above should always be taken in the office Press Letter Book.

If any difference of opinion arises between the Surveyors and the owners, manufacturers, or others, or any questions

are raised, the facts should be submitted to the "Senior Engineer Surveyor" for consideration, and to the Board, if necessary.

145. The Marine Board cannot regard as a satisfactory survey of a new steamship a survey made only after the hull is complete, and is cemented and painted. Surveyors are, therefore, instructed to decline to grant declarations for any new steamer, unless they inspected her before she was painted or cemented.

New ship to be surveyed before being painted or cemented.

Any survey made while the vessel is being built is not to interfere with the complete inspection afterwards, but is to be made solely with a view of enabling the Surveyors to form an opinion of the workmanship, material, and construction.

The bottoms of new vessels need not be examined by the Surveyor in dry dock after launching, if they have been examined by the Surveyor before launching, unless he has special reasons for considering it necessary.

In cases in which the Surveyors decline to grant declaration in consequence of not having inspected the vessel before the hull was painted and cemented, the owners or builders should be referred to the Marine Board, in order that the Board may decide specially in each case what steps should be taken.

Surveyors are sometimes called upon by owners to examine the bottoms of vessels during the night time. As such examinations cannot be considered satisfactory by the Marine Board, the Surveyors are instructed not to attempt to examine the bottom of vessels except during daylight.

146. If any steamer, usually plying in another Colony or district, is to be surveyed in New South Wales, it may be desirable to communicate with the Surveyor who last inspected the vessel before granting a declaration.

Survey of ships from another Colony.

147. When a vessel is partially surveyed by one Surveyor and completed by another, they must each sign for their respective portions of the work.

Partial survey.

148. Surveyors are in no case to give a declaration for any steamship unless they are thoroughly satisfied that all the requirements of the Navigation Act have been complied with.

Caution in giving declaration.

149. The Board will hold each Surveyor responsible to the fullest extent for the performance of the duty entrusted to him, and will support him in any reasonable steps he may think necessary to carry it out.

Surveyor held responsible for proper performance of duties.

When short certificates are required special application must be made to the Secretary in writing.

Examination of
hulls in dock.

150. Surveyors are to examine the hulls of all passenger steamers at least once every year, and due notice (twenty-four hours) should be given in writing to enable the inspection to be made *before* the vessel is painted. They should examine plating, pintles, and braces of rudder, the bearings of propeller, shaft, play in bushes, &c., as well as all cocks, valves, and connections on ship's skin. Surveyors are not to examine "bottoms" except during daylight.

Watertight
collision bulkhead
and watertight
compartment round
stern tube of
screw shaft.

151. A collision watertight bulkhead, also an after watertight compartment to cover the stern tube of the screw-shaft, must be fitted in *all sea-going steamers—both new and old.*

Other
bulkheads.

152. As regards other bulkheads, the Surveyors should *not* refuse to grant a declaration upon the ground that they are not fitted, or are defective, unless they are of opinion that the want of, or the defective state of the bulkheads renders the ship unseaworthy. In all such cases a full statement of their reasons should be forwarded to the Board.

Screw tunnels.

153. In all iron passenger steamers the tunnels should be constructed of iron, of ample strength and watertight, with a stuffing-box round the shaft at forward end. All openings manholes, &c., in floors must be fitted with doors or covers so arranged that they can easily and quickly be made watertight. If the tunnel is entered by any opening abaft the engine-room bulkhead the passage down from upper deck must be of iron, strong and watertight. Cocks or valves and pipes must be fitted to let the water off the floor of the tunnel, and must be made to shut or open from the upper deck. If there is an opening through the engine-room bulkhead into the tunnel, a properly constructed watertight door should be fitted to it and arranged to open and shut from upper or main deck.

Passenger
certificates.

154. In the following cases in which passenger certificates are required, the Surveyors must not grant a declaration without a previous reference to the Marine Board unless satisfied as to the provisions mentioned in this Article.

Surveyors should require this Regulation to be carried out in the following cases where passenger certificates are required:—

- (1.) New vessels.
- (2.) Old vessels not previously surveyed for a passenger certificate.
- (3.) Paddle vessels converted into screws.
- (4.) When new engines are fitted into a vessel.

In vessels which have already received passenger certificates this regulation need not be enforced, if there be an

effective arrangement of watertight bulkheads, decks, floors, and stuffing-boxes, which will so confine the water entering the ship from the aftermost stuffing-box as to prevent it finding its way into the ship in such quantity as will interfere with her safety.

In cases of new ships thus fitted a report and plan should be sent to the Board before a declaration is given. Declarations may be granted for vessels plying in partially smooth and smooth water without watertight tunnels.

155. The Surveyors should examine all parts of the ship, viz., plating, stringers, frames, floors, &c., very particularly in the engine-room, boiler space, and coal-bunkers—the hunkers of course being empty. They should also, if necessary, have the cement removed to enable them to form a correct opinion of the true state of the ship's skin. The roses of deck and bilge pumps and the sluices and cocks on the bulkhead should be inspected. Internal examination.

The bilge injection should always be taken to pieces and cleaned every survey.

156. The Surveyors will keep a written record of all the work they do, viz., date of docking, condition of hull and machinery, also the nature and extent of all defects and repairs, &c. Condition of hull and machinery. Record to be kept.

157. Any questions of doubt as to the strength of vessels should be referred to the Board. When a vessel which has been surveyed for a passenger certificate is not in every respect in good condition, although the defects may not be sufficient to warrant the withholding of the required declaration, and although the vessel may be practically fit for the service intended, the Surveyor should, when he grants the declaration, forward to the Board a report showing the nature of the defects in question. Strength of vessels.

158. It is very desirable that sketches of the midship sections of all vessels should be supplied to the Surveyors. Midship section.

159. The Board have reason to believe that many casualties at sea happen through the engine-skylights, coamings, companions, &c., being of light construction and insufficiently secured, instead of being of sufficient strength to form permanent parts of the structure of the ship, also that casualties arise through the fronts of poops and bridge-houses being weak and insufficiently secured. It has also come to their notice that the fore and aft beams, or "strong backs" in the hatchways and the hatches themselves are often too weak to bear the pressure of the water which may find its way on to them in a heavy sea. Coamings, skylights, scuppers, ports, gratings, &c.

The Surveyors should, in granting declarations for passenger steamers, look especially to these points, and if

they have any doubt should call the attention of the "Senior Engineer Surveyor" to the subject, and should not grant a declaration without his authority.

The Surveyors should, in like manner, in case of ships other than passenger steamers, look to these amongst other points when reporting a ship for detention as unsafe.

Construction of
new vessels.

160. The size, strength, and sufficiency of the scantling for the hulls of all new sea-going passenger steamers, built of iron or steel, will be calculated in accordance with Lloyd's Rules, and it is very desirable that tracings (on cloth), with figured dimensions, quality of material, &c., should be submitted to the Surveyors before the work is commenced.

In cases of special construction, such as light draught, bar harbour work, or for any particular purpose or trade which may not admit of the application of the "Rules," full particulars, including plans, should be supplied for the Board's consideration.

Ceiling of all
ships to be re-
moved as Sur-
veyor thinks
necessary.

161. For examining the internal part of all ships, they should have parts of the ceiling removed in order that they may ascertain the condition of the ship. They should also carefully examine the cement to ascertain its condition; and where they find it cracked or doubtful, they should extend their examination, and cause such a portion of the cement to be removed as may, in their judgment, be necessary to enable them to form a correct opinion as to the state of the ship covered by the cement.

The roses for the deck pumps, also those for the bilge pumps, should be taken out of the bilges and cleaned, and the sluices and cocks on the bulkheads, if any, inspected and put in good working order.

Examination of
vessels in engine-
room, coal
bunkers, &c.

162. The Surveyors should examine all parts of the ship (that is, plating, stringers, frames, floors, &c.) very particularly in the engine-room, boiler space, and coal bunkers, the bunkers of course being empty.

Strength of
vessel.

163. Any question of doubt as to the strength of vessels should be referred to the Marine Board.

When a vessel which has been surveyed for a passenger certificate is not in every respect in good condition, although the defects may not be sufficient to warrant the withholding of the required declaration, and although the vessel may be practically fit for the service intended, the Surveyor should, when he grants the declaration, forward to the Marine Board a report showing the nature of the defects in question.

It is advisable that sketches of the midship sections of all vessels entered therein be made in the docking book.

164. When application is made for survey for passenger certificate of a vessel propelled by electricity or other mechanical power, the Surveyor should be guided as to the survey of the hull and equipments by the Marine Board printed and other Regulations with respect to the survey of steamships. If the propelling machinery, or any portion of its accessories is such as will, in the Surveyor's judgment, injuriously affect the hull or equipments, or any portion thereof, the Surveyor should report fully to the Marine Board regarding the effects anticipated, as well as to the means, if any, for preventing them which the owner is willing to adopt.

Vessels propelled by electricity or other mechanical power.

With regard to the propelling machinery (or any portion of its accessories) employed, the Surveyor should, before issuing his declaration, report fully to the Board as to the principles involved in its construction, and as to the exceptional dangers, if any, which would, in the Surveyor's judgment, attend its use, such plans being appended to the report as may be necessary to make it intelligible.

The estimated speed of the vessel in knots per hour, the number of revolutions of the propelling shaft, and the probable time which the machinery is capable of maintaining that speed, should be included in the report. The issue of this statutory declaration for vessels propelled in any manner not contemplated by the Board's present printed Regulations, should in all cases be withheld until the sanction of the Board has been obtained.

Cylindrical Boilers—Iron.

165. When cylindrical boiler shells are well constructed, Shells. well designed, and made of the best material, they shall have an advantage in the working pressure over boilers inferior in any of the above respects, for unless this is done the superior boiler is placed at a disadvantage, and good workmanship and material will be discouraged. The following rules will therefore show how the different classes of work will be treated:—

When cylindrical boiler shells are made of the best material, with all the rivet holes drilled in place, and all the seams fitted with double butt straps, whose thickness must be at least five-eighths ($\frac{5}{8}$) of the plates they cover, and all the seams at least double-riveted with rivets having an allowance of not more than 75 per cent. over the single shears, and provided that the boilers have been open to inspection during the whole period of construction, then 5 may be used as the factor of safety.

Strength of the iron.

166. The tensile strength of the iron is to be taken at 47,000 lb. per square inch with the grain, and 40,000 lb. across it; but when the above conditions are not complied with, the additions in the following scale must be added to the factor 5, according to the circumstances of each case.

167. Additions to the factor of safety 5 :—

Longitudinal seams.	Holes.	A	.15	Fair, and drilled out of place after bending.
		B	.3	Fair, and drilled out of place before bending.
		C	.3	Fair, and punched after bending.
		D	.5	Fair, and punched before bending.
		E	.75	When holes are not fair and good.
	Kind of joint.	K	.2	Seams, lap, and double-riveted.
		L	.1	Seams, lap, and treble-riveted.
		M	.3	Seams, single butt-straps, double-riveted.
		N	.15	Seams, single butt-straps, treble-riveted.
		O	1.0	Seams, any kind, single-riveted.
Circumferential seams.	Holes.	F	.1	Fair, and drilled out of place after bending.
		G	.15	Fair, and drilled out of place before bending.
		H	.15	Fair, and punched after bending.
		I	.2	Fair, and punched before bending.
		J*	.2	When holes are not fair and good.
	Kind of joint.	P	.1	Seams, single butt-straps, double-riveted.
		Q	.2	Seams, single butt-straps, single-riveted.
		R	.1	Seams, double butt-straps, single-riveted.
		S	.1	Seams, lap-joints, double-riveted.
		T	.2	Seams, lap-joints, single-riveted.
Long boilers.	†	U	.25	Seams, lap-joints, strakes not entirely under and over.
		V	.3	When the boiler is of such a length as to fire from both ends, or is of unusual length, such as flue-boilers, and the circumferential seams are fitted as described opposite P, R, and S, but when the seams are as described opposite Q, T, then V .3 will become V .4.
		W	.4	When the seams are not properly crossed, or when material is doubtful, and not of a quality satisfactory to the Surveyor.
Crossing seams or doubtful material.				
Inspection.		Y	1.65	When the boiler is not open to inspection during the whole period of construction.

Where marked * the allowance may be increased still further if the workmanship or material is very doubtful or very unsatisfactory.

Where marked † when the circumferential seams are double-strapped and double-riveted or lap and treble-riveted, and the calculated strength not less than 65 per cent. of the solid plate, then V .3 may be omitted.

Holes bored out or rimmed in place.

When the holes are to be rimmed or bored out in place, the Surveyor will use his judgment as to the reduction or omission of A, B, G, and I.

168. When boilers that have not been open to inspection during construction, the case should be submitted to the principal officer as to the factors to be used. Boilers not open to inspection.

169. The strength of ordinary joints is found by the following method :— Plate and rivet section.

$$\frac{(\text{Pitch} - \text{diameter of rivet}) \times 100}{\text{pitch.}} = \left\{ \begin{array}{l} \text{Percentage of plate at joint, as compared with the solid plate.}^* \end{array} \right.$$

$$\frac{(\text{Area of rivet} \times \text{No. of rows of rivets}) \times 100}{\text{pitch} \times \text{thickness of plate.}} = \left\{ \begin{array}{l} \text{Percentage of strength of rivets as compared with solid plate.}^{\dagger} \end{array} \right.$$

(See Appendix D.)

170. (*) The maximum pitch of the rivets should not exceed $8\frac{1}{2}$ inches; and if in any case the Surveyor finds the pitch in excess of this he should report to the Chief Engineer Surveyor. Maximum pitch.

(†) If the rivets are exposed to double-shear multiply the percentage as found by 1.75. Then take iron as equal to 47,000 lb. per square inch, and use the smaller of the two percentages as the strength of the joint, and adopt the factor of safety as found from the preceding scale. (See par. 160.)

171. $47,000 \times \text{percentage of strength of joints} \times \text{twice the thickness of the plate in inches.}$ Shell pressure rule.

Inside diameter of boiler in inches \times factor of safety = working pressure allowed in safety-valves per square inch. (See the formula as given in detail in Appendix D.)

172. Double butt-straps must not be less in thickness than five-eighths of the plates they cover. Butt-straps.

Single butt-straps (if holes are punched) must be $\frac{1}{8}$ inch thicker than the plates they cover.

Butt-straps must be cut from plates, not from bars, and of quality equal to shell-plates, and for longitudinal seams must be cut across the grain. The rivet-holes may be punched or drilled *out* of place, but, when drilled *in* place, must be taken apart, the "burr" taken off, and slightly countersunk from the *insides*.

Lap-joints, when drilled in place, must be treated in the same way.

In all kinds of joints drilled rivet-holes must have the edges countersunk where the rivet is in shear.

Diameter of
rivet.

173. The diameter of the rivet should in no case be less than the thickness of the plate of which the shell is made, but it will be found when the plates are thin, or when lap-jointed or single butt straps are adopted, that the diameter of the rivets should be in excess of the thickness of the plates.

The minimum diameter of the rivets for lap-joints in which the pitch of the rivets in the outer rows is twice that of the inner rows may be found by the formulæ in the Appendix D, page 200.

Man-holes.

174. All man-holes and openings must be stiffened with strengthening rings, having at least the same effective sectional area as the plate cut out, and in no case should the rings be less in thickness than the plates to which they are attached.

All man-holes in cylindrical boilers should have their shortest diameter placed longitudinally, and it is very desirable that the strengthening should be made of **L** or **T** iron.

The neutral part of the boiler-shells (under steam-chest) must be efficiently stiffened and stayed.

Dished and
spherical ends.

175. All cambered or dished ends, if not truly spherical or exposed to flame, will be treated as flat surfaces.

When the camber forms a portion of a true sphere the stays, when solid, may have a stress of 14,000 lb. per square inch of net section; but the strain should not exceed 10,000 lb., when the stays have been welded or worked in the fire.

The strength of a sphere, to resist internal pressure is double that of a cylinder of the same diameter and thickness; that is, when the cambered end forms a portion of a sphere equal to twice the diameter of the boiler-barrel, their respective strengths are equal.

Flat surfaces.

176. The working pressure on plates forming the flat surfaces is found by the following formula :—

$$\frac{C \times (T \times 1)^2}{S - 6} = \text{working pressure.}$$

T = Thickness of plate in sixteenths inch.

S = Surface supported in square inches.

C = Constant, according to the following circumstances :—

C = 100, when the plates are not exposed to the impact of the heat or flame, and the stays are fitted with nuts and washers, the latter being at least three times the diameter of the stays, and two-thirds the thickness of the plates they cover.

If the diameter of the riveted washers be at least two-thirds the pitch of the stays, and the thickness not less than the plates they cover, the constant C may be increased to 150. Increase of C.

When doubling-plates are fitted of the same thickness as the plates they cover, and not less in width than two-thirds of the pitch of the stays, the constant C may be increased to 160.

When doubling-plates cover the whole of the flat surface, the case should be submitted to the principal officer for consideration. Increase of C.

C = 90 when the plates are not exposed to the impact of heat or flame, and the stays are fitted with nuts only.

C = 80 when the plates are exposed to the impact of the heat or flame, with water in contact with the plates, and the stays screwed into the plate and fitted with nuts.

C = 60 when the plates are exposed to the impact of heat or flame and steam in contact with the plates, and the stays fitted with nuts and washers, the latter being at least three times the diameter of the stay and two-thirds the thickness of the plate they cover.

C = 60 when the plates are exposed to the impact of the heat or flame with water in contact with the plate, and the stays screwed into the plate, having the ends riveted over to form a substantial head.

C = 54 when the plates are exposed to the impact of heat or flame, and steam in contact with the plate, and the stays fitted with nuts only.

C = 36 when the plates are exposed to the impact of heat or flame, and steam in contact with the plates, with the stays screwed into the plates, and having the ends riveted over to form a substantial head.

In cases where plates are stiffened by T or L irons, and a greater pressure is required for the plate than is allowed by the use of the above constants, the case should be submitted to the principal officer for consideration.

When the riveted ends are much worn, or when the nuts are burned, the Surveyor will exercise his own judgment.

- Stays.** 177. In the case of new boilers the Surveyors may allow a stress of 7,000 lb. per square inch of net section on solid iron, screwed stays, supporting flat surfaces ; but the stress should not exceed 5,000 lb. where the stays have been welded or worked in the fire.
- Portable stays.** In boilers, where portable stays are fitted, both single and double eyes should be bored out, the pins turned in the lathe, and the joint finished with the same care and exactness as a piece of engine work.
- Diagonal stays.** The areas of diagonal stays are found in the following way :—Find the area of a direct stay needed to support the surface, multiply this area by the length of the diagonal stay, and divide the product by the length of the line drawn at right angles to the surface supported to the end of the diagonal stay ; the quotient will be the area of the diagonal stay required.
- Gusset stays.** When gusset stays are used, their area should be in excess of that found in the above way (on account of the surface exposed). Gussets should, if possible, always be arranged in "double shear."
- Stays and girders for flat surfaces.** 178. When the tops of combustion chambers or other parts of a boiler are supported by solid rectangular girders, the following formula should be used for finding the working pressure to be allowed on the girders, assuming that they are not subjected to a greater temperature than the ordinary heat of steam, and in the case of combustion chambers—that the ends are fitted to the edges of the tube-plate and the back plate of combustion box :—
- $$\frac{C \times d^2 \times T}{(W-P) D \times L} = \text{Working pressure.}$$
- W = Width of combustion box in inches.
P = Pitch of supporting bolts in inches.
D = Distance between the girders from centre to centre in inches.
L = Length of girder in feet.
d = Depth of girder in inches.
T = Thickness of girder in inches.
C = 500 when girder is fitted with one bolt.
C = 750 when girder is fitted with two or three bolts.
C = 850 when girder is fitted with four bolts.
- The working pressure for the supporting bolts and for the plate between them should be determined by the rule for ordinary stays.
- Stay-tubes.** 179. All tube-plates must be stayed by stay-tubes or solid stays, and will be set off in accordance with the rules for ordinary stays.

180. The Surveyors should not in any case allow a greater compressive stress on the tube-plates than is obtained by the following formula :— Compressive stress on tube-plates.

$$\frac{(D-d) T \times 150,000}{W \times D} = \text{Working pressure.}$$

D = Least horizontal distance of tube centres.

d = Inside diameter of ordinary tubes in inches.

T = Thickness of tube-plates in inches.

W = Extreme width of combustion chamber in inches, from front of tube-plate to back of fire-box, or the distance between combustion box tube-plates, when the boiler is double-ended, and the box common to the furnaces at both ends.

181. Respecting wet-bottomed boilers, and those placed so low as to render examination impossible, the Surveyor should (if he has any doubt) have them lifted every four (4) years. Boiler bottoms which cannot be seen or examined.

If the owners in any special case have any good reasons for not lifting them, the Surveyor will submit the whole case to the principal officer for consideration.

It is very desirable that whenever boilers are lifted they should be subjected to the hydraulic test before being reset; the amount of pressure being left to the judgment of the Surveyors.

Furnaces.

182. Circular furnaces with the longitudinal joints welded or made with a butt strap :— Circular furnaces.

$$\frac{90,000 \times \text{the square of the thickness of plate in inches}}{(\text{Length in feet}) \times \text{diameter in inches}}$$

= Working pressure per square inch, provided it does not exceed that found by the following formula :—

$$\frac{8,000 \times \text{thickness in inches}}{\text{Diameter in inches.}} = \text{Working pressure per square inch.}$$

The second formula limits the crushing strain on the material to 4,000 lb. per square inch.

If the furnace is made with rings, the length is measured by the distance between the ring centres.

If the longitudinal joints instead of being butted are lap-jointed in the ordinary way, then 75,000 is to be used instead of 90,000, excepting only where the lap is bevelled, and so made as to give the furnace the form of a *true* circle, when 80,000 may be used. Alteration of the constant, 90,000.

When the material or workmanship is not of the best quality, the above constants may be further reduced according to circumstances, and the judgment of the Surveyor as in cases of corrosion, pitting, and exceptional wear.

- One of the conditions of good work is, that the joints are either double-riveted with *single* butt straps or single riveted with *double* butt straps, all the rivet-holes drilled in place *after bending* and the plates taken apart afterwards, the burr on holes removed, and all holes slightly countersunk from the outside.

The following table will show the application of the various constants to the different classes of work :—

Furnaces with butt joints and drilled holes.	90,000 where the longitudinal seams are welded.
	90,000 where the longitudinal seams are double-riveted with single butt straps.
	80,000 where the longitudinal seams are single-riveted with single butt straps.
	90,000 where the longitudinal seams are single-riveted with double butt straps.
Furnaces with butt joints and punched holes.	85,000 where the longitudinal seams are double-riveted with single butt straps.
	75,000 where the longitudinal seams are single-riveted with single butt straps.
	85,000 where the longitudinal seams are single-riveted with double butt straps.
	80,000 where the longitudinal seams are double-riveted and bevelled.
Furnaces with lapped joints and drilled holes.	75,000 where the longitudinal seams are double-riveted and not bevelled.
	70,000 where the longitudinal seams are single-riveted and bevelled.
	65,000 where the longitudinal seams are single-riveted and not bevelled.
	75,000 where the longitudinal seams are double-riveted and bevelled.
Furnaces with lapped joints and punched holes.	70,000 where the longitudinal seams are double-riveted and not bevelled.
	65,000 where the longitudinal seams are single-riveted and bevelled.
	60,000 where the longitudinal seams are single-riveted and not bevelled.

Fire-boxes of upright fire-boxes of donkey boilers, &c. In the case of upright fire-boxes of donkey or similar boilers, 10 per cent. should be deducted from the constants given above, applicable to the respective classes of work.

Corrugated furnaces of iron. 183. The working pressure for corrugated furnaces, practically circular and machine made, provided the plain parts

at the ends do not exceed 6 inches in length, and the plates are not less than $\frac{5}{16}$ inch thick, should not be greater than found by the following formula :—

$$\frac{9,000 \times \text{thickness in inches}}{\text{Mean diameter in inches.}} = \text{Working pressure.}$$

(For mean diameter of Fox's corrugated furnace, see Appendix D, page 264.)

184. The strength of the joints of cylindrical superheaters and the factor of safety are found in a similar manner as for cylindrical boilers and steam receivers, but instead of using 47,000 lb. as the tensile strength of iron, 30,000 lb. is adopted, unless where the heat or flame impinges at, or nearly at, right angles to the plate, then 22,400 lb. is substituted. Cylindrical
Superheaters,

When a superheater is constructed with a tube or tubes, exposed to *external* pressure, the working pressure should be found by the rules for circular furnaces, but the constants will be reduced as 30 is to 47.

In all cases the internal steam pipes should be so fitted that the steam in flowing to them will pass over all the plates exposed to the impact of heat or flame.

Superheaters should, as regards survey, be deemed to be the *most important parts* of the boilers and must be inspected *inside* and *outside*; those that cannot be entered on account of their size and arrangement must have a sufficient number of doors through which a thorough inspection of the whole of the interior can be made.

Special attention should be paid to the examination of superheaters, as with high pressure and exposure to flame the plates may become dangerously weak and brittle.

Before commencing the survey, the Surveyor should question the Engineer as to the tendency of the boilers to flame, and if so, extra care should be taken in fixing the working pressure, as the tensile strength of the plate when heated is often reduced to about 4 tons per square inch.

Drain pipes must in all cases be fitted to superheaters, in which a collection of water in the bottom is possible.

185. Superheaters that can be shut off from the main boiler must be fitted with a safety-valve of sufficient size; but the least size passed without special written authority should be 3 inches in diameter. Safety-valve for
superheaters.

186. The flat ends of all boilers, as far as the steam space extends, and the ends of superheaters, should be fitted with shield or baffle plates, where exposed to the hot gases in the up-take; as all plates subjected to the direct impact of heat or flame are liable to get injured unless covered with water. Shield plates.

Haystack
boilers.

187. As the up-takes of haystack boilers and others of this type are especially liable to injury from overheating, unless careful precautions are taken while steam is being raised, the Surveyor should, in all cases, endeavour to persuade makers and owners to make the strength of the up-takes considerably in excess of that required for ordinary superheaters subject to external pressure.

The employment of bowling rings is beneficial by adding to the strength as well as allowing for expansion; but if there is a difficulty in getting these fitted, hoops riveted round, although not so desirable as bowling-rings, can be employed to increase the resistance of the tubes against collapse. The use of bowling-rings with a moderate thickness of plate is better than very thick plating. This applies to the up-takes of all boilers of this type, including ordinary vertical donkey boilers. Bowling-rings fitted to all such up-takes would be a decided advantage in allowing for expansion. When flaming coal is used, extra care is required, and extra strength absolutely necessary.

Steel Boilers.

Maker's tests.

188. All steel boiler-plates must be legibly stamped with maker's name or brand, and it is very desirable that importers should have maker's certificate, certifying to their tensile strength and elongation. Should there be any doubt the Surveyor will have strips cut from the plates and tested in the Government testing machine.

Surveyor's tests.

189. It is not necessary that the Surveyor should witness the tests, although it is very desirable he should, when his other duties will allow him to do so, but he should see that all the plates and bars are properly marked. He should, however, select of each thickness *at least* one in four of these plates, either at the steel works or at the boiler-makers' works, and witness the testing of at least one strip or piece cut from each selected plate; but when shell plates exceed 15 feet in length, there should be a tensile test from each end; and when they exceed 20 feet in length and at the same time exceed 6 feet in breadth, or exceed $2\frac{1}{2}$ tons in weight, there should be a tensile test from each corner. In the latter cases the testing of each plate should be witnessed by the Surveyor. The mean results of the tests, if they fall within the Board's requirements as stated below, should be stamped on the plates. If a large number of failures take place in the 25 per cent. selected, the Surveyors should see more than 25 per cent. of the plates to be used in the

boiler satisfactorily tested. If the plates from which the Surveyor selects the above proportion a greater stress is wished than is allowed for iron, tests for tensile stress and elongation should be made, also a few temporary and bending tests, and those for which no reduction of thickness is asked may be tested for resistance to bending and tempering only, if preferred. In the latter case, the tensile stress and elongation stamped on each plate should be reported by the Surveyor to the Marine Board, along with the results of the bending and tempering tests.

From the plates and bars, the tests of which have been stated to have been made by the steel-maker, and not witnessed by the Surveyor, the Surveyor may, if he thinks it advisable, select any plates or bars after they are in the boiler-yard and require specimens to be cut off and tested. If the results are not satisfactory, the whole of the plates, except those which were tested and found satisfactory by the Surveyor, may be liable to be rejected.

190. The breadth of the test strips for tensile stress should Test strips. be about two (2) inches, and the elongation taken in a length of 10 inches should be about 25 per cent., and not less than eighteen (18) per cent. when tested in the normal condition, in which condition the Board prefer the tests to be made; but if the plates are annealed—that is, treated to a red heat in a *plate* furnace—and immediately they are at that heat taken out and placed on the mill floor to cool, the elongation should not be less than 20 per cent.

The test pieces must not be annealed after they are cut off the plates. When the plates are not taken out of the furnace immediately they are red-hot, or if allowed to cool down in the furnace, or are covered with ashes or other non-conducting substance, it should be reported to the Board for their consideration and decision.

The Surveyor should always report to the Board whether the plates have been annealed, or if in the normal condition when the test pieces were cut off.

The test strips must be carefully prepared and measured, and they should be cut from the plate by a planing or other shaping machine.

The skin of the test pieces should not be removed by planing, shaping, or otherwise, the edges only being planed or shaped; and in no case should test pieces be prepared or reduced in size by hammering or otherwise working on the anvil.

191. The bending tests for plates *not* exposed to flame Bending test. should be made with strips in their normal condition; but

strips cut from furnaces, combustion chambers, &c., should be heated to a cherry red, then plunged into water of about 80°, and kept there until of the same temperature as the water, and then bent.

The bending strips should not be less than 2 inches broad and 10 inches long, and they should be bent until they break, or until the sides are parallel at a distance from each other of not less than three (3)-times the thickness of plate.

Tensile stress.

192. When full allowance over iron is wished, the tensile stress of the plates *not* exposed to flame should be not less than 27 tons, and should not exceed 32 tons, per square inch of section, and 29 tons should be the stress used in the calculation for cylindrical sheets if the plates comply with all the conditions as stated herein ; but when the minimum tensile stress of shell plates is not less than 28 tons, and allowance is wished for the excess, the case should be specially submitted for the consideration of the Board as to whether the stress in the calculations may be increased to 30 tons. The tensile stress of furnace, flanging, and combustion-box plates may range from 26 to 30 tons per square inch.

Annealing.

193. All plates that are punched, flanged, or locally heated, must be carefully annealed after being so treated.

Stay and rivet bars.

194. Stay and rivet bars should be tested for tensile strength and elongation, viz., one bar in twenty when the diameter of the bar does not exceed 1 inch ; one bar in twelve when not over $1\frac{1}{2}$ inches ; and one bar in eight when the diameter exceeds $1\frac{1}{2}$ inches.

Tensile stress, stays, &c.

195. The tensile strength of stay bars should be from 27 to 32 tons per square inch, with an elongation of about 25 per cent., and not less than 20 per cent., in a length of 10 inches. Solid steel screwed stays which have not been welded or otherwise worked after heating may be allowed a working stress of 9,000 lb. per square inch of net section, provided the tensile strength and elongation are as stated.

Steel stays which have been welded or worked in the fire have been found to be unreliable, therefore they should not be passed.

Rivet bars and rivets.

196. The tensile strength of rivet bars should be from 26 to 30 tons per square inch, with an elongation of not less than 25 per cent. in a length of 10 inches. The rivets, before being tested, should be carefully prepared, and the elongation should, when practicable, be taken in a length of two and a half times the diameter of the prepared part. The tensile strength of the rivets should be from 27 to 32 tons per square inch, and the contraction of area about 60 per cent. If the original size of the bars for rivets or

stays be reduced before testing, it must be done in the lathe or by machine; test pieces of any kind should not be prepared by treating and drawing down.

197. The rivet holes in the furnace and shell seams should be *drilled*; but if it is wished to punch them and afterwards anneal the plates in a proper furnace, or punch small holes in and afterwards bore them, the particulars of the punching and boring, or annealing, should be submitted to the Board for consideration *before being done*, but all punched holes should be made after bending. Perforating and annealing.

In cases where assent has been given for plates to be punched after bending and then annealed, the makers should stamp the plates with the words "punched after bending and then annealed."

The same will apply to plates punched and afterwards bored.

198. The pressure on plates forming flat surfaces is found by the following formula:— Constants for flat surfaces, steel boilers.

$$\frac{C \times (T + 1)^2}{S - 6} = \text{working pressure.}$$

T = Thickness of the plate in sixteenths of an inch.

S = Surface supported in square inches.

C = Constant according to the following circumstances.

C = 125 when the plates are not exposed to the impact of heat or flame, and the stays are fitted with nuts and washers, the latter being at least three times the diameter of stays, and two-thirds the thickness of the plates they cover.

C = 187.5 when the plates are not exposed to the impact of heat and flame, or the stays are fitted with nuts and washers, the latter two-thirds the pitch of the stays in diameter, and thickness not less than that of the plate they cover.

C = 200 when the plates are not exposed to the impact of heat or flame, and the stays are fitted with nuts, but doubling plates being used instead of washers. The width of the doubling plates being two-thirds the pitch of stays, and thickness same as plates they cover.

C = 112.5 when the plates are not exposed to the impact of the heat or flame, and the stays are fitted with nuts only.

C = 75 when the plates are exposed to the impact of the heat or flame, and steam in contact with the plates, and the stays fitted with nuts and washers, three times the diameter of the stay and $\frac{2}{3}$ the thickness of the plates.

C = 67.5 when the plates are exposed to the impact of the heat and flame, and steam in contact with the plates, but stays fitted with nuts only.

C = 100 when the plates are exposed to the impact of the heat or flame, and water in contact with the plates, and the stays screwed into the plates and fitted with nuts.

C = 66 when the plates are exposed to the impact of the heat and flame and water in contact with the plates, and the stays screwed into the plates and riveted over.

C = 39.6 when the plates are exposed to the impact of the heat and flame, and steam in contact with the plate, and stays screwed into the plates and riveted over.

Combustion
chamber girders
of steel.

199. Girders made of steel to find the working pressure. See the conditions and formula used for iron girders; but with this difference: The constant C has the following value:—

C = 550 when the girder is fitted with one bolt.

C = 825 when the girder is fitted with two or three bolts.

C = 935 when the girder is fitted with four bolts.

Steel Furnaces.

Steel furnaces
circular.

200. Circular furnaces, with the longitudinal joints welded, or made with a butt strap:—

$99,000 \times \frac{\text{the square of the thickness of plate in inches}}{(\text{Length in feet}) \times \text{diameter in inches}}$

= Working pressure per square inch, provided it does not exceed that found by the following formula, and using the following constants:—

C = 8,800 for plain flues.

C = 14,000 for Fox corrugated flues, as made by the Leeds Forge Company, and machine made and practically true circles, provided that the plain parts do not exceed 6 inches in length, and the thickness of plate not to be less than $\frac{5}{16}$ inch thick, or more than $\frac{5}{8}$ inch thick (unless referring same to the Chief Engineer Surveyor).

C = 14,000 for the Purves-Brown steel ribbed, and the ribs not to be more than 9 inches apart.

$\frac{C \times T}{D} = \text{Working pressure in pounds per square inch.}$

Where—

C = Constant, as above.

T = Thickness in inches.

D = Mean diameter for corrugated flues in inches.* The mean diameter for Fox's corrugated furnace is always equal to the least diameter + the greatest diameter $\div 2$. (See Appendix D, p. 264, for diagram.)

D = Outside diameter for plain and rib flues.

One of the conditions of good work is that the joints are either double-riveted with single butt straps or single-riveted with double butt straps, all the rivet holes drilled in place after bending, and the plates taken apart afterwards, the burr on the holes removed, and all holes slightly countersunk from the outside. The following table will show the application of the various constants to the different classes of work :—

99,000 where the longitudinal seams are welded.	Welded furnaces, or with butt joints and drilled rivet holes.
99,000 where the longitudinal seams are double-riveted with single butt straps.	
88,000 where the longitudinal seams are single-riveted with single butt straps.	
99,000 where the longitudinal seams are single-riveted with double butt straps.	
93,500 where the longitudinal seams are double-riveted with single butt straps.	Furnaces with butt joints and punched rivet holes.
82,500 where the longitudinal seams are single-riveted with single butt straps.	
93,500 where the longitudinal seams are single-riveted with double butt straps.	
88,000 where the longitudinal seams are lapped, bevelled, and double-riveted.	
82,500 where the longitudinal seams are lapped, but not bevelled and double-riveted.	Furnaces with lapped joints and drilled rivet holes.
77,000 when the longitudinal seams are lapped, and bevelled and single-riveted.	
71,500 when the longitudinal seams are lapped, single-riveted, but not bevelled.	
82,500 when the longitudinal seams are lapped, double-riveted, and bevelled.	
77,000 when the longitudinal seams are lapped, double-riveted, and not bevelled.	Furnaces with lapped joints and punched rivet holes.
71,500 where the longitudinal seams are lapped, single-riveted, and bevelled.	
66,000 when the longitudinal seams are lapped, single-riveted, and not bevelled.	

If the furnace is riveted in two or more lengths, the case should be submitted for consideration.

Steel Tube-plates.

Compressive stress on tube-plates.

201. A greater compressive stress should not be allowed on tube-plates than that found by the following formula :—

$$\frac{(D - d) T \times 20,000}{W \times D} = \text{working pressure.}$$

D = least horizontal distances between centres of tubes in inches.

d = inside diameter of tubes in inches.

T = thickness of tube-plate in inches.

W = extreme width of combustion-box in inches—from front of tube-plate to back of fire-box, or the distance between combustion-box tube-plates—when boiler is double-ended, and the box common to the furnaces at both ends.

Plate and rivet section (steel).

202. The rivet section, if of iron, in the longitudinal seams of cylindrical shells, where lapped, and at least double-riveted, should not be less than $\frac{1}{8}$ times the net plate section ; but if steel rivets are used, the section should be at least $\frac{2}{3}$ of the net section of the plate, if the tensile stress of the rivets is not less than 27 tons and not more than 32 tons per square inch. Therefore, in calculating the working pressure, the percentage strength of the rivets may be found in the usual way by the rules ; but in the case of iron rivets, the percentages found should be divided by $\frac{1}{8}$, and in the case of steel rivets by $\frac{2}{3}$, the results being the percentages required. For determining the pitch of rivets, special care must be taken so that this pitch will divide *equally* throughout the entire length of seam. If it does not, the pitch should be altered accordingly.

If the percentage strength of the rivets by calculation is less than the calculated percentage strength of the plate, calculate the working pressure by both percentages. When using the percentage strength of the plate use the nominal factor of safety suitable for the method of construction, as by the rules for iron boilers ; but when using the percentage of the rivets, use 5 as the factor of safety.

The less of the two pressures so found is the working pressure to be allowed on the cylindrical portion of the shell, or, otherwise in accordance with the formula in Appendix D.

Local heating.

203. Local heating of the plates should be avoided, as many plates have failed from having been so treated.

Welding, &c.

204. Steel plates which have been welded should not be passed if subject to a tensile strain ; and those welded and subject to a compressive strain should be efficiently annealed.

In all other respects the boilers should comply with the rules for iron boilers.

205. The Surveyors should have due notice—two or three days—when the plates, &c., will be ready for the test pieces to be cut from them. Notice of tests.

(The Surveyors will in all cases report all cases of failure of steel plates, &c., which may come to their knowledge.)

206. If steel is proposed for superheaters, all the particulars, drawings, &c., must be submitted before construction, but in all cases it should be discouraged for this purpose. Steel for superheaters, &c.

This includes and applies to the unshielded up-takes of all boilers, ordinary vertical donkey boilers included.

207. When the steel is not to be made by any of the following makers the case must be specially considered, and this should receive the careful attention of the Surveyors :— Makers of steel.

Messrs. Beardmore & Co.

„ J. Brown & Co.

„ C. Cammell & Co.

„ D. Colville & Sons.

„ The Landore Steel Company.

„ The Leeds Forge Company.

„ The Steel Company of Scotland.

„ The Weardale Iron and Coal Company.

„ The West Cumberland Iron and Steel Company.

„ The Consett Iron Co. (Limited).

„ The Glasgow Iron and Steel Co. (Limited).

„ Nettlefolds.

„ John Spencer & Sons (Limited).

„ Wright, Butler, & Co.

For plates and angles, stay, and rivet bars.

For stay and rivet bars.

208. As the Surveyors have to fix the working pressure on engines and boilers by a series of calculations, the Board, at the request of shipbuilders and owners, have arranged to receive plans and particulars of boilers and machinery *before the work is commenced*, by these means hoping to prevent questions arising after the machinery is finished. This practice has worked well in saving time, and in preventing expense, inconvenience, and delay to owners. Drawings, boiler tracings, &c.

209. The regulation printed form to be filled in with particulars of new boilers. (See Appendix D, page 179.) Regulation 193 printed form.

The “EngineerSurveyor” should therefore receive a report on all plans intended for passenger vessels.

All tracings should be on cloth, which will be retained and used by the Surveyors during construction.

On approval of the plans, the Surveyor will examine the work from time to time to see they are faithfully carried out.

In cases where plans have not been submitted he will of course measure the respective parts, note the details of construction and material, &c., before he gives his declaration.

Any novelty in construction, or of any departure from the usual and standard practice, as specified in these Rules, must be submitted in detail for the consideration of the Board.

Fee for examining drawings, &c.

210. Drawings or tracings of boilers, &c., may be submitted for examination upon payment of the fee of £2.

Engineers and boiler-makers should be advised of this arrangement, and all applications for the above should be made in writing to the Secretary of the Board.

Boilers—General.

Donkey boilers.

211. Donkey boilers connected in any way to the machinery used for propelling the vessel will be surveyed and fitted in the same way as the main boilers, having the same fittings complete. And as regards safety-valves, should comply with the same Regulations as the main boilers.

Stop-valves.

212. A stop-valve must always be fitted between the boiler and the steam-pipe, and where two or more boilers are connected with a steam receiver or superheater, between each boiler and the superheater or steam receiver.

The object of this is to allow any defective boiler to be shut off without affecting the others.

Boiler fittings.

213. All marine boilers must have the following fittings :—

Two safety-valves on each boiler, drip-pipe, waste steam-pipe carried well up above deck, stop-valve, check-valve, surface cock, blow-off cock, glass water-gauge, two or three test-cocks, whistle-cock and pipe, carried 8 feet above the deck. Test-cock for trying the water, and a cock for Surveyor's test-gauge.

When the gauge-glass is fitted to a standard with outside pipe connections, suitable cocks must be fitted top and bottom.

It is not desirable that the gauge-glass and test-cocks should be fitted to the same connection, as any choking of the pipes would render both useless.

In all cases the water connection should have an external or internal pipe, carried down low enough to ensure the glass getting solid water.

All the above fittings must be flange-jointed to the boiler, and the thickness of the flanges, section of the metal, the size and number of bolts in each flange must be in proportion to the pressure.

Any fittings screwed into high pressure boilers will not be passed if they are more than 1 inch in diameter.

As a large number of cocks, valves, &c., now made and sold as suitable for high pressure are quite unfit for the work, the Surveyors will specially see that all fittings about engines, boilers, or hulls are of the most substantial character, both as regards strength and material; inferior fittings must not be passed.

When there is more than one boiler in any steamer, each boiler must be treated separately and have all the requisite fittings.

All boiler fittings should have spigots on all the flanges.

No boiler or steam chamber is to be so arranged or constructed so that the escape of steam from it through the safety-valves can be wholly or partially intercepted by the action of any other valve.

When boilers are double-ended, and those of unusual width they must have water-gauges and test-cocks at each end or side, as the case may be.

214. Regarding any novelty of construction, and whenever any invention or new arrangement is to be fitted in any passenger steamer, it will be necessary to submit plans for approval before the work is commenced, and when any deviation from an approved plan is made, it should be submitted for the Board's consideration, and when any deviation is sanctioned it is only for that particular case, unless otherwise specified.

No new arrangement to be sanctioned until plans are submitted.

Surveyors should in all cases record on their declarations whether the boilers are made of iron or steel, and if made partly of steel and partly of iron they should specify for what parts either metal is used.

215. On every survey the Board expect and desire the Surveyor to go inside the boilers and make a thorough personal examination.

Inside of boilers to be examined.

When the boilers are not large enough to get into, the Surveyor will subject them to the hydraulic test once every year at least. When it is only stays that prevents getting in, he will order their removal and see them properly replaced, or made portable before completing survey.

216. If the boiler is too hot for the Surveyor to examine the inside with safety and convenience, he will decline to proceed until the boiler is sufficiently cooled down.

Surveyors not to go into hot boilers.

217. All new boilers, also those taken out of the ship for a thorough repair, may be tested to twice the working pressure in the presence and to the satisfaction of the Surveyors.

Hydraulic test.

This test should never be applied to boilers until the various parts have been measured, and the calculations made in accordance with the Rules.

The boilers of all steamers that have not previously had a passenger certificate should be tested by hydraulic pressure before a declaration is granted to them.

Old boilers.

218. When it is found necessary to test old boilers with cold water, the Surveyor must be careful not to overstrain them; but the test should always exceed the working pressure.

If any part of a main boiler near the uptake, fire-boxes, or furnaces is so constructed that the Surveyor cannot examine it, he is not to give a declaration, but should report the case to the Senior Engineer Surveyor, who will, if necessary, refer it to the Marine Board for instructions.

If for special reasons, and for special reasons only, the Surveyor cannot go inside a donkey-boiler, or other small boiler, he must distinctly state on the face of his declaration his reasons for not being able to do so.

When a vessel is partially surveyed by one Surveyor, and the survey is completed and a declaration granted by another, if the Surveyor who witnesses the test of the boilers by hydraulic pressure has an opportunity of examining them inside and outside after the test, such Surveyor should determine the pressure to be allowed on the boilers in question, taking care to inform the makers, owners, or agents, and the Surveyor who is ultimately to grant a declaration what pressure should in his opinion be allowed on them.

The amount of the hydraulic test, and the date on which it was last applied to the boilers, should be inserted in the Surveyor's declaration, and recorded in the Office Boiler Book.

Surveyors should pay particular attention to the examination and testing of steam pipes.

Hydraulic test
for new boilers.
Test to be
stamped on
boiler.

219. In the case of new boilers the amount of the hydraulic test, the date on which it was applied, and the initials of the Surveyor, must be stamped on the boiler, in a place where it can *always* be seen, thus :—

Tested to 200 lb.

14/9/91. W.D.C.

Expansion
joints.

220. In all cases in which a socket expansion joint is fitted to a bent pipe the Surveyor should require a fixed gland and bolts to be fitted, in order to prevent the end of the pipe being forced out of the socket. This Regulation should be complied with in all cases of bent pipes fitted with socket expansion joints.

It is also desirable that fixed glands and bolts should be fitted to the expansion joints of straight steam-pipes, as cases have occurred, particularly with small straight pipes, in which the ends of the pipes have been forced out of the sockets.

Surveyors will also pay particular attention to the examination and testing of steam-pipes.

221. In boilers, where any of the fittings, &c., are of cast-iron, the Surveyor should be thoroughly satisfied as to the strength and soundness of the castings. Cast-iron fittings.

Cast-iron steam domes, steam-pipes, or stays will not be passed.

The Surveyors should discourage cast-iron saddles and chocks for boilers, especially for sea-going vessels.

222. A pressure once allowed on a boiler of a passenger steamer is not, *under any circumstances whatever*, to be increased, unless the Surveyor has previously written for and obtained the sanction of the Board. Working pressure not to be increased.

Safety-valves.

The Regulations of the Marine Board respecting safety-valves, are as follows :—

223. Every passenger steamer shall be provided with two safety-valves upon each boiler so constructed as to be out of the control of the engineer when the steam is up, and having sufficient area (in proportion to the pressure carried) to relieve the boilers, under all possible conditions of firing, &c., the maximum accumulation never to exceed 10 per cent. of the working pressure. Safety-valves.

The Surveyors are instructed and will see that in all cases the safety-valve chest shall be placed directly on all boilers, also that the neck or part between the chest and the flange, which is bolted to the boiler, should be as short as possible, and be cast in one with the chest.

If any person place an undue weight on the safety-valve of any steamship, or in the case of steamships surveyed under the Act, increase such weight beyond the limits fixed by the Engineer Surveyor, he shall, in addition to any other liabilities he may incur by so doing, incur a penalty not exceeding £100.

Area of Safety-valves.

224. The area per square foot of fire-grate surface of Government safety-valves will be in proportion to the steam pressure, and should not be less than that given in the

following table, provided the valves are not less than 2 in. in diameter. This applies to new vessels, or vessels which have not received a passenger certificate.

When the safety-valves are of the usual construction they must be so made as to keep the accumulation within moderate limits (not more than 10 per cent.); but as boilers with forced draught require valves considerably larger than those found by the tables, the design of the valves proposed for such boilers should be submitted to the Senior Surveyor for consideration.

If there is only one valve on any main boiler the Surveyor will not grant a declaration without referring the case to the Board for special instructions. (This refers to foreign vessels which may be surveyed in New South Wales.)

225.—*Table of Safety-valve Areas.*

Boiler Pressure.	Area of Value per square foot of fire-grate.	Boiler Pressure.	Area of Value per square foot of fire-grate.	Boiler Pressure.	Area of Value per square foot of fire-grate.
lb.		lb.		lb.	
15	1·250	44	·635	73	·426
16	1·209	45	·625	74	·421
17	1·171	46	·614	75	·416
18	1·136	47	·604	76	·412
19	1·102	48	·595	77	·407
20	1·071	49	·585	78	·403
21	1·041	50	·576	79	·398
22	1·013	51	·568	80	·394
23	·986	52	·559	81	·390
24	·961	53	·551	82	·386
25	·937	54	·543	83	·382
26	·914	55	·535	84	·378
27	·892	56	·528	85	·375
28	·872	57	·520	86	·371
29	·852	58	·513	87	·367
30	·833	59	·506	88	·364
31	·815	60	·500	89	·360
32	·797	61	·493	90	·357
33	·781	62	·487	91	·353
34	·765	63	·480	92	·350
35	·750	64	·474	93	·347
36	·735	65	·468	94	·344
37	·721	66	·462	95	·340
38	·707	67	·457	96	·337
39	·694	68	·451	97	·334
40	·681	69	·446	98	·331
41	·669	70	·441	99	·328
42	·657	71	·436	100	·326
43	·646	72	·431	101	·323

Table of Safety-valve Areas.

Boiler Pressure.	Area of Valve per square foot of fire-grate.	Boiler Pressure.	Area of Valve per square foot of fire-grate.	Boiler Pressure.	Area of Valve per square foot of fire-grate.
lb.		lb.		lb.	
102	·320	135	·250	168	·204
103	·317	136	·248	169	·203
104	·315	137	·246	170	·202
105	·312	138	·245	171	·201
106	·309	139	·243	172	·200
107	·307	140	·241	173	·199
108	·304	141	·240	174	·198
109	·302	142	·238	175	·197
110	·300	143	·237	176	·196
111	·297	144	·235	177	·195
112	·295	145	·234	178	·194
113	·292	146	·232	179	·193
114	·290	147	·231	180	·192
115	·288	148	·230	181	·191
116	·286	149	·228	182	·190
117	·284	150	·227	183	·189
118	·281	151	·225	184	·188
119	·279	152	·224	185	·187
120	·277	153	·223	186	·186
121	·275	154	·221	187	·185
122	·273	155	·220	188	·184
123	·271	156	·219	189	·183
124	·269	157	·218	190	·182
125	·267	158	·216	191	·181
126	·265	159	·215	192	·181
127	·264	160	·214	193	·180
128	·262	161	·213	194	·179
129	·260	162	·211	195	·178
130	·258	163	·210	196	·177
131	·256	164	·209	197	·176
132	·255	165	·208	198	·176
133	·253	166	·207	199	·175
134	·251	167	·206	200	·174

226. The Surveyor in his examination of machinery and boilers is to give special attention to the safety-valves, and whenever he considers it necessary, he is to satisfy himself as to the pressure on the boiler by actual trial. Examination of safety-valves.

The Surveyor should examine the whole of the valves, weights, and springs at every survey.

All safety-valves must be fitted with suitable lifting gear, so arranged that two or more valves on any one boiler can at all times be eased together, without interfering with the valves on any other boiler. The lifting gear should in all

cases be arranged so that it can be worked by hand either from the engine-room or stoke-hole. In harbour steamers it should always be fitted handy to engine-driver on deck.

All safety-valves must have a lift equal to one-fourth of their diameter.

The openings for the steam to and from the valves (including waste steam-pipe) should each have an area not less than the area of valves required by the Table, and each valve-box to be fitted with drain-pipe at its lowest part.

In the case of lever valves, if the lever is not bushed with brass, the pins must be of brass; iron and iron working together must not be passed (if enclosed).

The Surveyor will be careful in seeing that the valves have a free and proper lift, also a free escape for the steam, as it is obvious that unless the lift and steam escape are ample, the effect is the same as reducing the area of the valve or putting on an extra load.

The valve seats should be secured by studs and nuts.

The Surveyors are, as far as in their power, to make the opinion of the Board on these points generally known to the owners of passenger steamers.

Surveyors to see
valves weighted.

227. When the Surveyor has determined the amount of pressure, he is to see the valves weighted accordingly, and the weights or springs fixed in such a manner as to preclude the possibility of their shifting or in any way increasing the pressure.

The limits of the weight on the valves is to be inserted in the declaration, and should it at any time come to a Surveyor's knowledge that the weights or the loading of the valves have been shifted or otherwise altered, or that the valves have been in any way interfered with, so as to increase the pressure, without the sanction of the Marine Board, he is at once to report the facts.

Spring Safety-valves.

228. If the following conditions are complied with, the Surveyor need raise no question as to the substitution of spring-loaded valves for dead-weighted valves:—

- 1st. That the valves are the proper size, and in accordance with the table, par. 225.
- 2nd. That the springs and valves be so cased in that they cannot be tampered with.
- 3rd. That provision be made to prevent the valves flying off in case of the springs breaking.

- 4th. That the requisite safety-valve area is cased in in the usual manner of Government valves.
- 5th. That screw-lifting gear be provided to lift *all the valves*, as by par. 226.
- 6th. That the size of the steel of which the springs are made is to be found by the following formula:—

$$\frac{\sqrt{s \times D}}{C} = d$$

S = load on the spring in lb.

D = diameter of spring in inches (centre to centre).

d = diameter or side of square of the steel in inches.

C = 8,000 for round steel.

C = 11,000 for square steel.

- 7th. That the springs be protected from the steam and impurities issuing from the valves.
- 8th. That when the valves are loaded by direct springs the compression screw must have a distance washer fitted to prevent undue compression.
- 9th. That the springs have a sufficient number of coils to allow a compression under the working load of at least one quarter the diameter of the valve.
- 10th. That at least two valves are fitted to each boiler.

Spring-valves must be tested cold and under steam.

Springs to be subjected to a dead weight load, equal to the pressure they have to bear, for forty-eight hours, and tested also under a full head of steam, with good fires, engines stopped, and all connections shut off. Twenty minutes' trial.

If the accumulation exceeds 10 per cent. of the working pressure full particulars of the trial must be submitted for consideration.

When testing safety-valves or boilers, the Government test-gauges must be used *in addition to the ship's gauges*, and all boilers must be fitted with a ("test-cock") to enable the Surveyors to apply their gauges when steam is up.

In some spring valves the accumulation of pressure has reached cent. per cent., and therefore if the Surveyor had not required a trial he would have passed valves which would have caused a pressure on the boilers double that intended by him. And in some cases, in which the increase in pressure has not been great, defects that would have rendered the valves highly dangerous have been discovered on an examination of the drawings.

The Surveyors should arrange with manufacturers so that the Surveyors may have the designs of valves which the manufacturers intend to use. An easy method of facilitating this matter is for the manufacturer to leave in the Surveyor's office a plan of his valve or valves when once agreed upon, and then afterwards to inform the Surveyor that the valves fitted are according to drawings A, B, C, as the case may be. By this means, when once a design has been agreed upon and is adhered to, all subsequent questions and delays will be prevented.

Standard designs
of safety-valves
approved of.

229. The following is a list of the names of Spring Safety-valve makers whose standard designs have been approved by the Board of Trade:—

Name of Firm whose Standard Designs have been approved.	Address.	Diameter of Valves included in Standard Design.
		Inches.
Adams, Thos.	Manchester	2 to 6
Alley and M'Lellan	Glasgow	2 to 6
Allsup and Sons	Preston	3 to 4½
Amos and Smith	Hull	3 to 5
Bailey and Leitham	„	3 to 3½ and 4½
Bailey & Co., W. H.	Manchester	2 to 6
Blair & Co.	Stockton-on-Tees ...	3 to 4 and 6½
Bow, M'Lachlan, & Co. ...	Paisley	2 to 4
Central Marine Engineer- ing Company.	West Hartlepool ...	3 to 4
Clarke, E., & Co.	Brinscombe	2
Clark, Geo.	Sunderland	3 to 5½
Clarke, Chapman, & Co....	Gateshead-on-Tyne.	3
Cochran & Co.	Birkenhead	2 to 3
Cockburn, D.	Glasgow	2 to 6½
Cockburn & Co., Geo.	„	2 to 6½
Coe, W. J.	Liverpool	3 to 6½
Cox & Co.	Falmouth	2 to 3½
Dansey and Robinson	London	2
Davis, G.	Abingdon	2
Day, Summers, & Co.	Southampton	2 to 2½ and 3½ to 5½
Dickenson and Sons, John	Sunderland	3 to 3½
Dickson, R., & Co.	Middlesbrough	2½ to 3
Earle's Shipbuilding Co....	Hull	3 to 6
Empire Company	Manchester	2 to 6
Fletcher, John	Ashton-under-Tyne	3 to 4
Fraser & Co., A. B.	Liverpool	3 to 5½
Gourlay Brothers & Co. ...	Dundee	2 to 2½ and 3½ to 5½
Hall, Russell, & Co.	Aberdeen	3 to 5
Harding, Cocks, & Co.	London	3 to 4½
Harvey & Co. (Limited) ...	Hayle	3 to 4½
Hawthorn, R. & W.	Newcastle-on-Tyne.	4
Henderson, D. and W. ...	Glasgow	3 to 6½
Hepple & Co.	North Shields	4½

Name of Firm whose Standard Designs have been approved.	Address.	Diameter of Valves included in Standard Design.
		Inches.
Holmes & Co., C. D.	Hull	4 $\frac{1}{2}$
Hopkinson, J., & Co.	Huddersfield	2 to 6 $\frac{1}{2}$
Lobnitz & Co.	Renfrew	4
London and Glasgow Engineering Company.	Glasgow	3 to 6
Noakes and Son, T.	London	2
Palmer's Shipbuilding Co.	Jarrow-on-Tyne ..	3 to 5 $\frac{1}{2}$
Pattison, G. A.	Liverpool	3 to 6 $\frac{1}{2}$
Paul, M., & Co.	Dumbarton	2
Plenty and Sons	Newbury	2 to 3
Pollack and Macnab	Manchester	2 and 3 to 6 $\frac{1}{2}$
Pollack, Macnab, and Highgate.	Glasgow	2 and 3 to 6 $\frac{1}{2}$
Rennoldson, J. P.	South Shields	4
Richardson and Sons, T.	Hartlepool	3 $\frac{3}{4}$ to 5 $\frac{3}{4}$
Roger & Co., R.	Stockton-on-Tees ..	2 $\frac{5}{8}$ to 3 $\frac{1}{2}$
Royal Mail Steam Packet Company.	Southampton.....	3 to 5 $\frac{1}{2}$
Shepherd & Co.	Liverpool	2 to 6
Sissons, W., & Co.	Gloucester	2
Stephenson & Co., R.	Newcastle-on-Tyne.	3 to 6
Stephenson & Co., J. C.	Preston	3
Taylor & Co., Jas.	Birkenhead	3
Turnbull & Co., A.	Glasgow	3 to 6 $\frac{1}{2}$
Tyne General Ferry Co.	Newcastle-on-Tyne.	3 $\frac{5}{8}$
Wallsend Slipway Co.	Wallsend-on-Tyne..	4 and 4 $\frac{1}{2}$
Westgarth, English, & Co.	Middlesbrough	3 to 3 $\frac{1}{2}$
Mort's Dock and Engineering Company.	Sydney .....	.....
Atlas Engineering Co. ....	„ .....	.....
Chapman & Co. ....	„ .....	.....
Halliday Brothers .....	„ .....	.....

230. Owners, masters, and engineers to see that valves are kept in proper order. Owners, masters, and engineers to see that valves are in proper order.

It is clearly the duty of masters and engineers to see, in the intervals between the surveys, that the Government safety-valves, as well as other safety-valves and the rest of the machinery, are kept in proper order.

There is no provision in the Navigation Act of New South Wales, exempting the owner of any vessel, on the ground that she has been surveyed by the Government Surveyors, from any liability, civil or criminal, to which he would otherwise be subject.

The Act of Parliament requires the Government safety-valves to be out of the control of the engineer, when the steam is up, this does not in the slightest degree lessen his

responsibility, as the Board consider it one of the most important duties of the engineer to see that all safety-valves are kept in thorough working order.

All tests for pressure and accumulation are to be made with Marine Board gauges in addition to ship gauges.

231. In witnessing the hydraulic tests of boilers, &c., and in witnessing all safety-valve tests for accumulation of pressure, the Surveyors are to use the pressure gauges supplied by the Marine Board for the purpose. The steam gauge should not be used without a syphon filled with water between it and the boiler.

Machinery, &c.

What machinery is to be surveyed.

232. The machinery to be surveyed comprises the engines and boilers used for propelling the vessel and all connected therewith.

The boilers of donkey engines are to be surveyed with the boilers and machinery of the vessel when they are in any way connected with them.

Boilers that are used exclusively for loading or unloading the vessel, and which are entirely unconnected with the ship's propelling power, do *not* form a part of the machinery to be surveyed by the Merchant Shipping Act of 1854.

Machinery to be taken to pieces at least once a year.

233. Upper brasses of all bearings taken off.

Shafting turned round and carefully examined.

Cylinder-covers and junk rings lifted for examination of pistons and cylinders.

Slide-covers removed for examination of slides, and, if necessary, slides taken out.

Air and circulating-pump covers lifted for examination of the valves and buckets.

All cocks and valves on the boilers to be taken out and examined.

Covers of feed and bilge pumps taken off for examination of valves.

All discharge valves and sea-cocks taken out for inspection.

Bilge injection overhauled every survey.

Propeller-shaft drawn when necessary for examination of thimbles, bush, screw, and stern-pipe.

Boilers to be empty, quite cool, and all man and mud-hole doors to be off.

Furnace-bars and *bridges* to be out in each boiler.

Furnaces, flues, up-takes, backs, super-heaters, &c., to be swept clean, and all deposits, water, &c., cleared out of shell bottoms.

If the bottom of boiler is below stoke-hole plates they (the plates) must be lifted, and boiler fronts chipped clean.

Safety-valves, springs, weights, &c., to be out of each boiler, and a means on board for weighing them.

All pipes and cocks on the ship's skin to be accessible to the Surveyor.

Shaft and tunnel to be clean and clear for the examination of plomer blocks, bearings, and stern bush-gland.

234. Several collisions have occurred in consequence of the sounding gear not acting; the bridge handle was moved, but the bell in the engine-room did not ring. This was caused by the excessive "wear" on the "sounding fingers," and other external parts. It is therefore important that the Surveyors should see all dials and gear taken to pieces once every year, and at every survey the bridge and engine-room telegraphs be examined, compared, and checked to his satisfaction.

Telegraph dials and sounding gear.

235. In the examination of the machinery and boilers the Surveyor should in no case give a declaration without thoroughly satisfying himself that both the boilers and the machinery are sufficient for the service intended, and in good order.

Examination to be carefully made.

236. Where the feed-cock is so arranged that more than one boiler can be fed through it at the same time, a non-return valve must be fitted between each boiler and this cock; but it is very desirable that all feed-cocks should have a non-return valve fitted between each boiler and the feed-cock.

Non-return valves on feed-cocks.

237. The boilers of all new passenger steamers (including all harbour and river vessels) must be fitted with separate feeding arrangements in addition to, but unconnected with, the main feed pipes and valves.

Separate feed connections, &c.

In very small vessels an efficient hand-pump instead of a donkey may be used, if satisfactory to the surveyors, provided there are separate feed pipes and valves as directed above.

The main feed-pipe in all passenger steamers should be fitted with a relief valve and air-vessel on the delivery side of the pump.

238. In harbour and river steamers having non-condensing engines, an approved injector may be fitted instead of a donkey for feeding the boilers. This must always be in addition to the usual feed pumps.

Injectors.

Injectors for condensing engines, or where the feed is hot, will not be considered an efficient part of the feeding arrangements.

Notice for Survey.

Notice for
survey.

239. Notice and fee to be sent to the Secretary of the Marine Board forty-eight hours before the date of survey.

Cocks and valves
on ship's skin.

240. All inlets or outlets in the bottom or side of a vessel, near to, at, or below the deep load water-line, other than the outlets of water-closets, soil-scupper, lavatory, and urinal pipes, must have cocks or valves fitted on ship's skin, so arranged to be accessible at all times.

When there is a difficulty in carrying out the above regulation, a strict compliance may be dispensed with if the Surveyor is satisfied that the arrangements existing are, on the whole, safe.

Guards to blow-
off cocks.

241. With a view to the prevention of accidents to boilers through the blow-off cocks being left open, after the boiler is run up, and to prevent water getting accidentally or intentionally into the ship by cocks being left open, all blow-off cocks and sea-connections *below the plates and out of sight*, are to be fitted with a guard over the plug with a feather-way in the same, and a key on the spanner, so that the spanner cannot be taken out unless the plug or cock is closed.

When cocks are in sight, guards need not be fitted, provided the spanners are secured to the plugs by pins. The spanners should not be shrunk on the heads of the plugs.

Non-return
valves to pipes.

242. In all cases where pipes are so arranged that water can run from the boiler or the sea into the bilge, either by accident or intentionally leaving a cock or valve open, they should be fitted with a non-return valve and a screw, not attached, but which will set the valve down in its seat when necessary. The only exception to this is the fireman's ash-cock, which must have a cock or valve on the ship's side, and be above the stoke-hole plates.

Wooden
steamer's
fittings.

243. In wooden steamers, all the cocks and valves on the ship's skin must be of brass or gun-metal. Cast-iron valves will not be passed, as its connection with the copper renders it, in a short time, unsafe. This applies to fittings below water-line.

Donkey exhaust
not to go
through ship's
side.

244. Exhaust pipe of donkey should not be led through ship's side, but must be led on deck or into waste steam-pipe, and in all cases should have a drain-cock on it.

Cocks at distance
from ship's side.

245. Cocks or valves standing at exceptional distances from the ship's plating, must be of brass or gun-metal, and well bracketed.

Cast-iron stand-
pipes.

Cast-iron stand-pipes, through which hot brine would have to pass, should never be passed.

246. In the case of the outlets of water-closets, soil, scupper, lavatory, and urinal pipes, which are below the weather deck, there should be an elbow of good substantial metal other than cast-iron or lead; and the pipe connected with this elbow should, if of lead, have a sufficient bend to allow for expansion in the pipe, or any movement from the working of the ship.

Water-closet
outlets and
scupper-pipes.

Pipes, no matter of what material they may be constructed, are never to be fitted in a direct line between the hole in ship's side and its connection with the deck, closet, or any other fitting.

Unless the water-closet and scupper-pipes are fitted in the way hereby required, or in a manner that will in the opinion of the surveyor be equally safe, he should refuse to grant a declaration.

Where closets are fitted below the water-line, as in the case of pumping closets, plans should be specially submitted for approval.

Closets above the weather-deck do not require any special regulations.

All pipes and valves must be protected from the cargo by a substantial casing of wood or iron.

This paragraph applies only to the case of steamers (sea-going) coming under survey for the first time.

247. In the case of boilers and machinery, it may be impracticable to apply any satisfactory tests to the material used after the boilers or machinery are placed in the ship without great inconvenience and delay to the shipowners.

Tests of material
and fees.

With a view to obviate such inconvenience and delay, the surveyor is authorised, at the request of the manufacturer, or of the person for whose intended ship the material is being manufactured, to inspect and test such material during manufacture.

Such request must be made on such forms as the Marine Board may from time to time direct, and must be accompanied with a written undertaking to pay the Marine Board on the delivery of the certificate.

Such sum for travelling expenses as the Board may consider and determine will be necessary to cover loss of time, subsistence, and other expenses.

If no such inspection of material is made during manufacture, the Surveyor is not to give a declaration in the case of steel boilers or machinery unless he has satisfied himself, by requiring a sufficient number of plates or quantity of material to be taken out and tested, or in some other effectual manner,

that the material and workmanship are entirely satisfactory, and in no case without a special reference to the Marine Board.

Spare gear and stores to be carried.

248. In the case of steamers coming in for survey under the Passenger Acts, and other steamers performing ocean voyages, no question as to gear need be raised if the following spare gear and stores are supplied, or their equivalent, which should be submitted to the Marine Board for consideration. The heavier portions of this gear should have been fitted and tried in its place, and should be kept on board where access can at all times be had to it :

- 1 pair of connecting rod brasses.
- 1 air-pump bucket, and rod with guide.
- 1 circulating pump bucket and rod.
- 1 air-pump head valve, seat and guard.
- 1 set of india-rubber valves for air-pumps.
- 1 set circulating pump head valves, seat and guard.
- 1 set india-rubber valves for circulating pump.
- 2 main-bearing bolts and nuts.
- 2 connecting rod bolts and nuts.
- 2 piston rod bolts and nuts.
- 8 screw shaft coupling bolts and nuts.
- 1 set piston springs.
- 1 set if of metal, or 3 sets if of india-rubber, of feed-pump valves and seats.
- 1 set if of metal, or 3 sets if of india-rubber, of bilge-pump valves and seats.
- 1 hydrometer.
- Boiler-tubes—3 for each boiler.
- 100 iron assorted bolts, nuts, and washers, screwed, but need not be turned.
- 12 brass bolts and nuts, assorted, turned and fitted.
- 50 iron bolts and nuts, assorted, turned and fitted.
- 50 condenser tubes.
- 100 sets of packing for condenser tube ends, or an equivalent.
- At least, 1 spare spring for escape valves.
- 1 set of water-gauge glasses.
- $\frac{1}{10}$ of the total number of fire-bars necessary.
- 3 plates of iron, assorted.
- 6 bars of iron, assorted.
- 1 complete set of stocks, dies, and taps suitable for the engines.
- 1 smith's anvil.
- 1 fitter's vyce.
- Ratchet-brace and suitable drills.

- 1 copper or metal hammer.
- Suitable blocks and tackling for lifting weights.
- 1 dozen files, assorted, and handles for same.
- 1 set of drifts or expanders for boiler tubes.
- 1 set of safety-valve springs (if so fitted) for every four valves ; if there are not four valves, then at least one set of springs must be carried.
- 1 screw-jack.
- And a set of engineer's tools suitable for the service, including hammers and chisels for vice and forge ; solder and soldering iron ; sheets of tin and copper ; spelter, muriatic acid, or other equivalent, &c., &c.

Engine Fittings, &c.

249. All expansive surface-condensing engines (sea-going) are to be fitted as follows :—

One steam-gauge, connected directly to boiler ; one vacuum gauge, connected to condenser ; one steam gauge on first receiver ; one compound gauge, connected to second receiver ; relief valve on each receiver, suitably loaded ; relief valves on cylinders, top and bottom ; relief valves and air vessels on delivery side of feed pumps ; a bilge injection (of ample size) connected to circulating suction, having non-return valve to prevent water getting into the ship.

Suitable valves, flanged to ship's side, for air, circulating, and bilge discharges, &c. ; bilge discharge carried up above deep load-line ; complete set of drain-cocks for cylinders, receiver, and slide jackets

Pipes connected with pumps worked by the engines must be carried through the bulk-heads into all the compartments, fore-and-aft of the engine-room, except the collision bulk-head, so that each compartment can be pumped out separately by the engines as well as by the deck pump. The pipes should be carefully covered and well secured when they pass through the bulk-heads.

All cocks and valves should (where possible) be fitted above the floor plates ; and every cock and valve should be clearly and legibly "indexed" in plain letters, so that *any* engineer can tell what it is for and where it leads to.

250. In all new steamers plans of the various compartments, showing the intended arrangements of the bilge, Bilge pipes and ballast tanks.

suction pipes, sluices, and roses connecting the main and donkey engine pumps with those compartments, should be submitted for approval.

Having in view the large amount of damage to cargo, &c., from faulty tank connections, it is very desirable that all steamers having water-ballast tanks should have their filling and pumping connections quite separate from other suction to holds and wells.

Size and Strength of Shafting.

Shafting.

251. Crank, tunnel, and propeller shafts must not be passed if found to be less in diameter than that found by the following rules—without submitting the whole case to the Marine Board for consideration. It will be found that first-class makers generally put in larger shafts than those found by the following formula :—

For compound condensing engines with two or more cylinders, when the cranks are not overhung :—

$$S = \sqrt[3]{\frac{C \times P \times D}{f(2 + \frac{D^2}{d^2})}}$$

$$P = \frac{f \times S^3}{C \times D^2} \left(2 + \frac{D^2}{d^2}\right)$$

Where S = diameter of shaft in inches.

d^2 = square of diameter of high pressure cylinder in inches or sum of squares of diameters when there are two or more high pressure cylinders.

D^2 = square of diameter of low pressure cylinder in inches or sum of squares of diameter when there are two or more low pressure cylinders.

P = *absolute* pressure in lb. per square inch, that is boiler pressure, plus 15 lb.

C = length of crank in inches.

f = constant from the following tables :—

For ordinary condensing engines, with one, two, or more cylinders, when the cranks are not overhung :—

$$S = \sqrt[3]{\frac{C \times P \times D^2}{3 \times f}}$$

$$P = \frac{3 \times f \times S^3}{C \times D^2}$$

NOTE.—Intermediate pressure cylinders do not appear in the formula.

Where S = diameter of shaft in inches.

D^2 = square of diameter of cylinder in inches or sums of squares of diameters when there are two or more cylinders.

P = *absolute* pressure in lb. per square inch, that is boiler pressure plus 15 lb.

C = length of crank in inches.

f = constant from the following table :—

For two Cranks, angle between the Cranks.	For Crank and Propeller Shafts f .*	For Tunnel Shafts f .
90°	1047	1221
100°	966	1128
110°	904	1055
120°	855	997
130°	817	953
140°	788	919
150°	766	894
160°	751	877
170°	743	867
180°	740	864
For three Cranks. 120°	1110	1295

* For paddle-engines of ordinary type multiply constant in middle column suitable for angle of crank by 1.4.

NOTE.—The intermediate cylinders do not appear in the formula when there is more than one high pressure, or low pressure cylinder, the sum of squares to be taken in each case respectively instead of d^2 or D^2 . When there is only one crank the constants applicable are those in the table opposite 180°.

Shafting for single engines will be calculated by the following rule :—

$$\sqrt[3]{\frac{A \times P \times \frac{S}{2} \times \text{factor of strength}}{9,600}} =$$

Where A = area of cylinder in square inches.

„ P = boiler pressure (+ vacuum in condensing).

„ S = stroke of piston in inches.

„ F = factor of strength { 9 for sea-going,
7 for harbour steamers.

„ 9,600 = constant divisor.

In harbour steamers, if the crank, propeller, tunnel, or paddle shafts are made of the best hammered iron; six (6) may be used as the factor of strength; but if cut from bars 7 will be used.

The Surveyors should discourage the use of bar iron for shafts.

Steel Shafting, &c.

252. In all cases where it is intended to fit steel shafts or where (in small steamers) it is proposed to fit solid *brass* propeller shafts, all particulars should be submitted for consideration.

Cast-iron Flat Surfaces.

253. The Surveyors are instructed to give special attention to the flat surfaces (cast-iron) about the engines, which are exposed to the steam pressure, especially slide-jacket doors, receivers, covers, &c., and they are to thoroughly satisfy themselves that the sectional strength and stiffness of the material is sufficient for the work.

Imported Machinery.

When owners
intend to import
engines and
boilers.

254. When owners intend to import marine engines and boilers, the Board strongly recommend that the said machinery, hull, &c., be constructed in accordance with the Board of Trade Rules.

In all such cases the owner or importer must produce an official certificate from the Board of Trade certifying that it has been constructed under the supervision of the Board's Surveyors.

When a satisfactory certificate is produced the Surveyor will merely see that the machinery is properly fitted in the vessel, and survey the ship under steam in the usual way.

This plan has been found to work well; it saves the owner much trouble, annoyance, and expense, besides being satisfactory to the Surveyors.

When marine machinery is imported, and which has *not* been constructed under the supervision of the Board of Trade, the Surveyors must be specially careful before granting a declaration.

The whole of the machinery must be opened up, and all the parts measured, calculated, and checked, for the pressure intended to be carried.

The material of which the boiler is constructed must be minutely examined, and in no case will the factor of safety be decided upon until the Surveyor has thoroughly examined the boiler and calculated the working pressure. If the Surveyor has any doubts, he may increase the factor of safety accordingly.

In cases where the boilers are of steel, the Surveyors will require the owner to furnish satisfactory proof that the steel is of suitable quality, and to produce evidence of its tensile strength and ductility, as ascertained from the results of

mechanical tests of pieces cut from the plates, &c., and that the treatment the steel received during the construction of the boilers accorded with the Marine Board's Rules for steel boilers.

If the evidence is not satisfactory, the boilers will be treated as if made of iron.

This includes engine, shafting, &c.

When machinery is imported it is very desirable that any drawings, specifications, or particulars relating to same should be sent to the Surveyor's office as soon as possible.

255. The distilling apparatus for emigrant ships should be taken to pieces every voyage, except in the case of steamers holding passenger certificates, which should be taken to pieces every six months, or oftener if the Surveyor think it necessary, and the tubes or coils tested to at least twice the load on the safety-valve on the apparatus, or in cases where no safety-valve is fitted, to twice the highest working pressure of the boiler, from which the apparatus can be worked, and the boiler and machinery thoroughly examined. After the distilling apparatus is put together again, it should be tested as to the quantity and quality of the water made.

Distilling
apparatus for
making fresh
water.

The water should be cold, pure, and fit to drink immediately it is drawn off from the filter. No distilling apparatus should be passed unless fitted with a suitable sized filter, charged with animal charcoal. The charcoal should be taken out, cleansed, or renewed every voyage, except in case of steamers holding passenger certificates, in which case it need not be taken out, unless the Surveyor thinks it necessary, oftener than every six months. In such cases (where passenger steamers are coming frequently in for survey under the Passengers Acts, and such complete examination is not made previous to each voyage), the Surveyor will be held wholly responsible for the efficiency of the apparatus; but the quantity and quality of the water must be tried previous to every voyage. It, therefore, rests with him whether he orders them to be taken to pieces or not every voyage. The boilers should be at least equal in strength to the boilers of passenger steamers and should have the same fittings as is necessary for them in accordance with the Marine Board Regulations. The Surveyor must satisfy himself as to the capability of the man who is to have charge of the apparatus.

The steam for working the apparatus is not to be taken from the main boilers. No exhaust steam must be permitted to go into the condenser if appliances for the introduction of lubricants be fitted to the steam pipes or steam cylinder of the pumping engine. The boiler of the apparatus must

not be filled or fed with water from the surface condenser of the main engines, and must not be fitted with cocks, &c., for the introduction of tallow or oil.

When the water is pumped into the condenser there should be an efficient escape-valve fitted to it, which cannot be readily tampered with; and if the condensing portion of the apparatus or cooler and fitter be unfit to bear the pressure on the boiler, an efficient safety-valve that cannot be readily overloaded should be fitted between the steam pipe and the apparatus.

Pump for distilling apparatus to be fitted as fire-engine.

256. It is advisable that the donkey engine for pumping water through the condenser be so fitted that it can be made available in case of emergency for extinguishing fire in any part of the ship. A leather hose, with suitable bends and conductors, should be supplied for the purpose.

Stores to be carried with distilling apparatus.

257. The following list of tools and materials should be provided for distilling apparatus :—

- | | |
|--------------------------------------|--|
| 1 set stoking tools. | 10 lb. cotton waste. |
| 1 scaling tool. | 1 deal box, with lock complete. |
| 1 spanner for boiler doors. | 2 gallons machinery oil. |
| 1 set fire bars suitable for boiler. | Animal charcoal to charge the filter at least twice. |
| 1 14-inch flat bastard file. | 1 can for machinery oil. |
| 1 „ half round file. | 1 oil feeder. |
| 1 10-inch round file. | 1 small bench vice. |
| 3 file handles. | 1 ratchet brace. |
| 2 hand cold chisels. | Drills, assorted. |
| 1 chipping hammer. | 1 set of dies and taps suitable for the bolts. |
| 1 pair patent gas tongs. | 2 glass salinometers. |
| 1 soldering iron. | 1 hydrometer and pot. |
| 10 lb. solder. | 1 shifting spanner. |
| 2 lb. rosin. | 1 lamp for engineer. |
| 6 gauge glasses. | And any other articles that the particular distiller and boiler supplied may, in the Surveyor's judgment, require. |
| 24 India-rubber gauge-glass washers. | |
| 30 bolts and nuts, assorted. | |
| 1 slide rod for donkey pump. | |
| 5 lb. spun yarn. | |

List of distilling apparatus that have been approved by the Marine Board.

258. Note any departure from the following designs, as approved, should be reported to the Marine Board for consideration :—

- | | |
|--------------------------------------|---------------------------------------|
| 1. Normandy's Patent. | 9. Siddeley & Co.'s Patent. |
| 2. Winchester and Graveley's Patent. | 10. Scott, Son, and Watt's Patent. |
| 3. Chaplin & Co.'s Patent. | 11. Smillie's Patent. |
| 4. Brown & Co.'s Patent. | 12. Rayner's Patent. |
| 5. Fraser's Patent. | 13. Russell's Patent. |
| 6. Hocking & Co.'s Patent. | 14. Union Steamship Company's Patent. |
| 7. Hocking and Son's Patent. | 15. Willoughby & Co.'s Patent. |
| 8. Kirkcaldy's Patent. | |

Nominal Horse-power of Engines.

259. The nominal horse-power of the engines has to be inserted in the Surveyor's declaration, and also in the certificate of survey. Nominal horse-power.

The Surveyors have hitherto accepted any statements of nominal horse-power supplied by owners or their agents, but experience has proved that in many cases such statements are often untrustworthy.

The Surveyor should in future calculate the nominal horse-power of engines by the following rule:—

1st. For ordinary condensing engines—

$$\frac{D \times N}{30} = \underline{\text{N.H.P.}}$$

D = diameter of cylinder in inches.

N = number of cylinders.

For compound engines—

$$\frac{(D^2 \times N) + (d^2 \times 2)}{30} = \underline{\text{N.H.P.}}$$

D = diameter of low-pressure cylinder in inches.

d = diameter of high-pressure cylinder in inches.

N = number of low-pressure cylinders.

n = number of high-pressure cylinders.

The application of this rule will decide what (in the opinion of the Board) shall be recognised as the nominal horse-power of the engines.

Measurement of Steamships for Passenger Accommodation.

260. These Directions for Measuring Steamships for Passenger accommodation are to be read in connection with Instructions herein contained, and paragraphs 15 to 23 Rules of Marine Board attached herewith.

All dimensions are taken in feet and decimal parts of a foot.

The first column of deductions is in all cases the length of encumbrances fore and aft, the second column is the breadth athwartships.

The reference letters a, b, c, &c., placed before the deductions refer to the incumbrances on the diagrams marked with corresponding letters.

APPENDIX A.

SURVEY A1.

Passengers in
foreign-going
steamships.

1. Foreign-going ship shall include any ship employed in trading beyond the jurisdiction of the Marine Board of New South Wales.

The upper weather deck and the upper surface of the poop, fore-castle, and spar deck being exposed to the weather are never to be included in the measurements for passengers in foreign-going steamers, nor are the poop, round-house, or deck-house to be measured for passengers unless they form part of the permanent structure of the vessel; but they should in all cases be railed round at the top to prevent children from falling overboard.

Care should be taken that the means provided for ventilation are sufficient to allow of a good supply of air in the event of the hatches being closed in bad weather. Places ventilated by hatches only, or in which provision is not made for a sufficient supply of air and light under *ALL* circumstances, should not be measured for passengers. (See A.—Survey 1.)

(A.—Surveys 1.) (See Par. 7, Appendix A.)

Lower Deck for Emigrants.
8314 length.

339·2 interval between breadths.

13· $\frac{1}{3}$ of common interval.

Breadths.	Multipliers.	Products.
33·	× 1	= 33·
37·5	× 4	= 150·
39·3	× 2	= 78·6
39·5	× 4	= 158·
39·7	× 2	= 79·4
39·5	× 4	= 158·
38·7	× 2	= 77·4
38·	× 4	= 152·
34·8	× 1	= 34·8

921·2

13· $\frac{1}{3}$ common interval.

27636

9212

11975·6 gross area of deck.

	Deductions.	
a.	9·9 × 10·3 =	101·97
b.	16·5 × 10·9 =	179·85
c.	5·5 × 2·3 =	12·65
d.	12· × 12·2 =	146·4
e.	8·7 × 2·2 =	8·14
f.	33·3 × 18· =	599·4
g.	24·7 × 22·6 =	558·22
h.	10·4 × 9·8 =	101·92
i.	6· × 5·7 =	34·2
k.	5·7 × 2·4 =	13·68

1756·43

1756·43 deductions.

10219·17

·7 height.

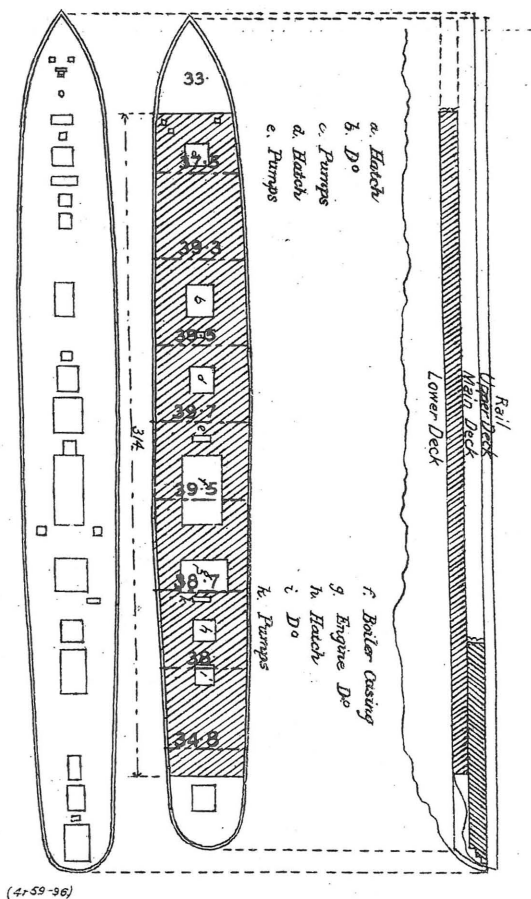
12)71534·19

6)5961·18

No. of Passengers at 72 cubic feet each .. 993
Passengers berth in poop .. 88

Total No. of Passengers .. 1081

A. Surveys 1. part



(47-55-36)

Surveys B2, C2, D2, E3, F3.

2. All ships employed in the Intercolonial Trade. The following rules shall apply: the words "fore-cabin and deck passengers" are intended to include all passengers, whether carried on deck or in the cabin, except passengers entered as after-cabin or saloon passengers in the way bill. All the passengers who are entered as fore-cabin passengers are to be allowed the use of all the space on deck not appropriated to after-cabin passengers.

Passengers in Intercolonial steamers.

3. In addition to and exclusive of a sufficient number of closets for cabin and saloon passengers, closets are to be provided for the *exclusive use of fore-cabin and deck passengers* in the ratio of three for every two hundred such passengers allowed by the passenger certificate, and a fair proportion must be allotted to the sole use of women and children, and so marked outside. Clear passages to these closets must always be maintained. In no case is a less number than two to be provided. These closets should be clean, well lighted, and well drained, and must be of sufficient height and size, and effectually protected from weather and sea. In carrying this regulation into effect there need never be more than six water-closets set apart for the exclusive use of the fore-cabin and deck passengers, whatever be the number of those passengers, provided there is also one suitable and accessible urinal for the use of fore-cabin and deck male passengers.

Water-closets in Intercolonial trade ships.

The cubic contents of water-closets and urinals erected *on deck* for the exclusive use of passengers on board sea-going steamers under this regulation are not to be included in the ship's tonnage, provided each is permanently and conspicuously marked outside as "Water-closet," or "Urinal," "for Fore-cabin and Deck passengers only."

4. When cattle are carried *on the open deck*, and are not under cover, the space occupied by them must be effectually shut off from the passenger space by bulkheads, wooden partitions, or otherwise. The partitions need not be close; but efficient washboards must be fitted to prevent the dung or urine of the cattle from getting on to the passenger space.

Arrangements necessary when cattle are carried.

Under cover.—If cattle are carried under cover on the same level deck as passengers, they are to be separated from the passenger space by a movable close bulkhead running alternately across the deck, and extending from the deck to the covering above, or must be otherwise efficiently separated.

In the hold.—If cattle are carried either in the 'tween decks or holds, then the passenger space must be effectually shut off from the cattle space, and separately ventilated, so that no effluvia from the cattle space can escape into the passenger space.

5. The aggregate number of passengers, other than saloon or first-class passengers as certified on the passenger certificate, is to be limited to six times the number for which there is a clear sheltered space for the voyage, such sheltered space may be, either space in a house on deck, or in a cabin below deck, or under a waterproof turtle—back open only at the after end, or in two or more of such spaces.

Deck shelter to be provided.

Spaces not consisting of a cabin or deck-house or a waterproof turtleback, as abovementioned, are not to be deemed to be deck shelter spaces in any steamship unless drawings are submitted and approved by the Marine Board.



Measurement of well-decked vessels.

6. The deck spaces between the top-gallant forecastle, raised quarter-deck, bridge-house, or poop, as the case may be, and which are known as wells, must not be included in the measurement for passengers, unless the freezing port area and the free board are ample, and the space is in all respects fit for passengers.

Marking and apportionment of space in coasting ships where fore-cabin and deck passengers are carried.

7. The marking of space for passengers carried on deck is to include a statement of the number of passengers allowed for each space when there is no deck cargo or other incumbrance on it.

Except in the cases referred to in paragraph 8, the following words are to be permanently marked during the time the passenger certificate is in force:

<p>The deck from this mark on both sides amidships to the raised quarter-deck* contains square feet, and is certified for † passengers when not occupied by cattle, animals, cargo, or other incumbrance.</p> <p style="text-align: center;"></p>	mark.	<p>The deck from this mark on both sides amidships to the windlass contains square feet, and is certified for † passengers when not occupied by cattle, animals, cargo, or other incumbrance.</p> <p style="text-align: center;"></p>
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* Or to the poop, or the wheel, or any other part of the deck to which the measurement in question is taken.

† State the number and the class of passengers.

Raised Quarter-deck.

Mark on break of deck.

This quarter-deck contains square feet, and is certified for * passengers when not occupied by cattle, animals, cargo, or other incumbrance.

* State number and class of passengers.

Poops.

Similar to raised quarter-decks.

Saloons and cabins for passengers other than deck or third-class need not be marked in any case.

Marking may consist of one notice in certain cases.

8. In cases in which the shipowner desires to receive on the passenger certificate a statement of the whole number of passengers (including saloon passengers as well as fore-cabin and deck passengers)

for whom there is accommodation on deck when the whole space is free from goods, cargo, cattle, or other incumbrance, that whole number may be stated in one sum; and the various spaces on deck for the accommodation of the various classes of passengers need not be marked. The owners will in this case be left to apportion as they please between the saloon passengers, on the one hand, and the fore-cabin or deck passengers, on the other, such of the deck space as may be clear each voyage; subject, however, to the two following conditions, viz. :—First, that for each passenger carried on deck in excess of the number for whom there is accommodation below, as stated on the certificate (whether he is a saloon passenger, or a fore-cabin or deck passenger), there shall be 9 square feet of clear space on deck, free from cargo, goods, cattle, luggage, &c.; and, secondly, that there shall be efficient shelter, as provided in Par. V, for one-sixth of the number of the passengers other than saloon passengers at any time carried. The marking of the ship in this case shall consist of one legible notice on deck, painted and placed in a conspicuous spot where it shall be visible *at all times* to the fore-cabin and deck passengers; and it shall state the total number of such passengers authorised by the certificate, and the fact that each such passenger while on board is entitled to 9 superficial feet of clear space; and that efficient deck shelter is provided for one-sixth of such passengers.

9. The length of the deck is to be taken from abaft the windlass to forward of the wheel aft, if there is one; but if there is not a wheel aft it must be taken to where passengers can stand comfortably clear of the tiller. Number of passengers on deck, how determined.

The breadths are to be taken from inside the gutter waterway, or the inside edge of the raised covering board, or inside edge of the rail, if the bulwarks tumble home further than the inside edge of waterway or covering board. Clear area means the space after all incumbrances, such as hatchways, skylights, companions, steam chest casings, funnel casings, wheel, windlass, binnacles, masts, dunnage for luggage, boats carried inboard, and fittings for cattle, &c., are deducted. No deck must be measured when bulwarks are not fitted, nor if they are not of sufficient height and strength. The whole clear space on the deck may be appropriated to the fore-cabin passengers, or it may be divided in any proportion between the fore-cabin and the after-cabin passengers, as may be determined on at the time of the survey.

The clear area of the deck in square feet is divided by 9; the quotient is the number allowed to be carried on deck. The sponsons in paddle-wheeled steamers are not to be included in the measurement of vessels for passengers. Passengers in coast-trade steamers are allowed to be carried on the upper and the lower decks only.

Where cargo, cattle, &c., are carried in the space measured for passengers in intercolonial passenger steamers, the following deductions are to be made :—

For every square yard of space measured for
 passengers occupied by cattle or other }
 animals, or by cargo or other articles. } one passenger.

If, however, the whole number so to be deducted on account of cattle or cargo carried on deck equals or exceeds the original number of passengers due to the deck space, no further deductions are to be

made from the number of passengers for any additional cargo so carried ; or, in other words, when no passengers are carried on deck it may be covered with cattle or cargo, without any reduction on that account in the number of passengers carried in the cabins.

Quarter-decks,
poops, &c.

For ordinary limited coast-trade voyages all spaces included on the upper surface of quarter-decks and poops are to be available for measurement, provided that the ship is stable enough, and the sides are either close boarded or otherwise sufficiently protected. If the sides are not close, proper weather cloths should be provided.

Number of
passengers below
deck, how
ascertained.

10. The number of passengers to be carried in the after-cabins, state rooms, or saloons; is determined by the number of the berths or sofas properly constructed for sleeping berths. The number of fore-cabin passengers is ascertained in the same way. So much of the floor of the saloons as is not covered by tables or permanent fittings may also be measured. All passenger accommodation should be properly lighted and ventilated, and proper means of ingress and egress provided. All floors of passenger accommodation must be caulked and properly secured. The lower hold must not be considered as proper accommodation for passengers, neither are spaces which consist of temporary accommodation upon the cargo, nor spaces lighted and ventilated by hatches. If the whole number of passengers obtained by the foregoing method exceeds the number representing the gross tonnage of the vessel, then the number of passengers must be reduced until the number does not exceed the number denoting the gross tonnage of the vessel; the number to be deducted may either be taken from the number of fore-cabin passengers or from the after-cabin passengers, or from both, in any proportion as may be determined on at the time of the survey.

Special
measurement
allowed for
limited coasting
voyages.

11. To meet the case of limited coasting vessels making short voyages, that is to say, when restricted to the places mentioned on their certificates, which are not to be greater than a distance of 20 miles apart, and the vessel is substantial and stable and fully equipped as a sea-going ship, and is fitted with either substantial bulwarks or sufficient weather cloths round the poop, raised quarter-deck, or substantial midship-house, then the surface of the poop, quarter-deck, or house, as well as so much of the floor space in the after-cabin below it as is floor-space wholly unencumbered by tables, sofas, chairs, seats, &c., &c., may be included in the measurement for passengers. When sofas or seats are fitted the measurements are to be taken from the back of the said sofas or seats, but in that case the number of berths in the cabin or saloon is not to be counted. The floor of state rooms bulkheaded off from the saloon or cabin is never to be measured for passengers; in their case the berths only are to be counted. Saloon floors, except as herein mentioned, are never to be measured for passengers, without direct instructions from the Marine Board.

Passengers in
deck-houses.

12. Where there are deck-houses and only narrow spaces between the sides of the deck-house and the bulwarks, such narrow spaces and not to be measured for passengers. When there is a deck-house amidships for the accommodation of after or first-class passengers, and the fore-cabin or second-class accommodation is either below, aft, or in a deck-house aft, then the whole of the clear space on deck should be appropriated for the use of fore-cabin and deck-passengers.

B Surveys 2.

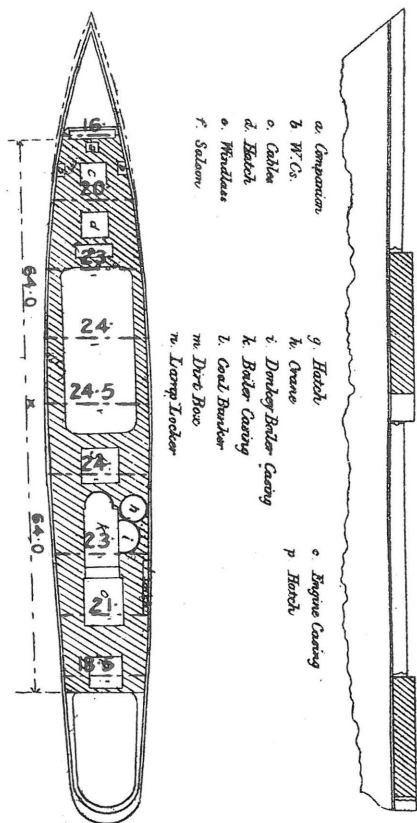


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B.—Surveys 2 (See paragraphs 2 to 12, Appendix A).

Length from a point amidships to windlass.

4)64.0 length.

3)16.0 interval between breadths

5.3 = $\frac{1}{3}$ common interval.

		Deductions.	
a.	3.0	× 2.5	= 7.5
b.	{ 3.8	× 2.8	= 10.64
c.	{ 3.8	× 2.8	= 10.64
d.	6.0	× 6.1	= 36.6
e.	6.6	× 6.7	= 44.22
f.	3.4	× 7.4	= 25.16
	30.4	× 17.3	= 520.73
			<u>655.49</u>

Breadths.	Multipliers.	Products.
16.0	× 1	= 16.0
20.0	× 4	= 80.0
23.0	× 2	= 46.0
24.0	× 4	= 96.0
24.5	× 1	= 24.5
		<u>262.5</u>
$\frac{1}{3}$ common interval		5.3
		<u>7875</u>
		18125
Gross area of deck		<u>1391.25</u>
		655.49
		<u>9735.76</u>

Number of persons at 9 square feet 81

Length from a point amidships to fore end of after deck-house.

4)64.0 length.

3)16.0 interval between breadths.

5.3 = $\frac{1}{3}$ common interval.

		Deductions.	
f.	2.7	× 17.3	= 46.71
g.	8.2	× 9.1	= 74.62
h.	6.0	× 6.0	= 36.
i.	7.7	× 5.4	= 41.58
k.	27.5	× 8.4	= 231.
l.	5.0	× 2.5	= 12.5
m.	3.0	× 2.5	= 7.5
n.	5.5	× 2.0	= 11.
o.	6.0	× 4.0	= 24.
p.	7.6	× 6.8	= 51.68
			<u>536.59</u>

Breadths.	Multipliers.	Products.
24.5	× 1	= 24.5
24.	× 4	= 96.
23.	× 2	= 46.
21.	× 4	= 84.
13.5	× 1	= 13.5
		<u>269.0</u>
$\frac{1}{3}$ common interval		5.3
		<u>807</u>
		1345
Gross area of deck		<u>1425.7</u>
		536.59
		<u>9889.11</u>

Number of persons at 9 square feet 98
 Add 81
 Total 179

Number of passengers at 9 square feet.. .. 179
 Number of berths 18
 1st class do 20
 Total 217

C.—Surveys 2—*continued*.

The whole of the available area of the main deck allowed for 3rd class passengers.

Deck from windlass to midships.

Deck from midship to break of quarter deck.

6)72 length.

4)39 length.

3)12 interval between breadths.

3)9·75 interval between breadths.

4 = $\frac{1}{3}$ common interval.

3·25 = $\frac{1}{3}$ common interval.

Breadths.		Multipliers.		Products.
16·1	×	1	=	16·1
20·6	×	4	=	80·4
23·0	×	2	=	46·0
24·7	×	4	=	98·8
25·7	×	2	=	51·4
26·0	×	4	=	104·0
25·6	×	1	=	25·6
				<u>422·3</u>
				4 = $\frac{1}{3}$ common interval.
				<u>1689·2</u> gross area forward.

Breadths.		Multipliers.		Products.
25·6	×	1	=	25·6
25·3	×	4	=	101·2
24·8	×	2	=	49·6
24·3	×	4	=	97·2
23·5	×	1	=	23·5
				<u>297·1</u>
				3·25 = $\frac{1}{3}$ common interval.
				<u>14855</u>
				<u>5942</u>
				<u>8913</u>
				<u>965·575</u> gross area aft.

Deductions.				Deductions.			
a.	3·4	×	2·6 = 8·8	g.	4·4	×	2·8 = 12·3
b.	4·4	×	3·1 = 13·6	h.	10·0	×	11·6 = 116·0
c.	6·5	×	8·7 = 56·5	i.	19·9	×	8·7 = 173·1
d.	{ 4·0	×	4·0 = 16·0	k.	6·4	×	2·4 = 14·4
	{ 4·0	×	4·0 = 16·0	l.	3·5	×	2·9 = 10·1
e.	10·0	×	11·6 = 116·0				
f.	19·0	×	16·8 = 319·2				

C. Surveys 2.

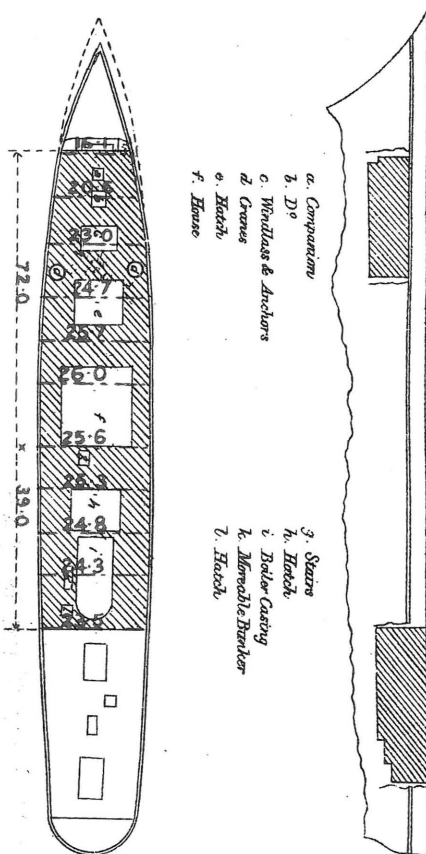


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D.—Surveys 2—*continued*.

Cattle pens, &c., fitted amidships.

Deck from top-gallant forecastle to fore end of house.

6)53 length.3)8·8 interval between breadths.2·9 = $\frac{1}{3}$ common interval.

Breadths. Multipliers. Products.

12	×	1	=	12
18·5	×	4	=	74
24	×	2	=	48
30	×	4	=	120
33·5	×	2	=	67
36	×	4	=	144
38·4	×	1	=	38·4

		Deductions.	503·4
a.	8·5	×	11·3 = 96·0
b.	4·4	×	2·5 = 10·0
c.	7·9	×	4·3 = 33·9
d.	4·3	×	7·4 = 31·8
e.	3·8	×	5·8 = 22·0
f.	{ 3·6	×	4 = 14·4
	{ 3·6	×	4 = 14·4
g.	7·3	×	9·2 = 67·1
		<u>289·6</u>	<u>289·6</u>

9)1170·26Passengers at 9 square ft. each .. 130Beds 24

After cabin.

2)9·0 length from after end of midship house to fore end of after house.3)4·5 interval between breadths.1·5 = $\frac{1}{3}$ common interval.

Breadths. Multipliers. Products.

40	×	1	=	40
39·8	×	4	=	159·2
39·6	×	1	=	39·6

238·81·5 = common interval.119402388

	Deduction.		
h.	7·7	×	10·9 = 83·9

9)274·330 passengers at 9 square feet each.Beds .. 38

				Total.
Number of passengers fore cabin	..	..	150	} 222
„ „ after cabin	..	..	62	

E.—Surveys 3. Saloon steamer available area on deck divided between 1st and 2nd class passengers.

See Pars. 3 to 12, Appendix A.

Deck from windlass to paddle shaft.

8)93 length.

3)11·6 interval between breadths.

3·86 = $\frac{1}{3}$ common interval.

Breadths.	Multiplier.	Products.
9·	× 1	= 9·
11·5	× 4	= 46·
14·	× 2	= 28·
16·	× 4	= 64·
17·	× 2	= 34·
19·	× 4	= 76·
19·2	× 2	= 38·4
19·5	× 4	= 78·
19·5	× 1	= 12·5

	Deductions.		392·9
a.	4·9 × 3·5 =	17·15	3·8 = $\frac{1}{3}$ common interval.
b.	4·9 × 3·2 =	15·68	
l.	28·8 × 12·6 =	362·88	31492
d.	11·5 × 13·7 =	157·55	11787
part of c. {	4·2 × 15· =	63·	
	4·6 × 10·3 =	47·38	1493·02 gross area of fore deck.
		<u>663·64</u>	<u>663·64</u>
			<u>9)829·38</u>

Number of persons at 2 square feet each 92·

Fore saloon.

Length 28· × breadth 11·4 = 319·2
 Deduction c. 7·5 × 4·4 = 33·
9)286·2

31· passengers at 9 square feet each

Fore cabin
2)21·6 length.

3)10·8 interval between breadths..

3·6 = $\frac{1}{3}$ common interval.

Breadths.	Multipliers.	Products.
14·9	× 1	= 14·9
16·3	× 4	= 65·2
17·9	× 1	= 17·9
		<u>98·0</u>
		3·6 = $\frac{1}{3}$ common interval.
		<u>588</u>
		<u>294</u>
		<u>9)352·8</u>
		<u>39·</u> passengers at 9 square feet each.

umber of passengers on fore deck = 92 + 31 = 123
 Do in fore cabin = 30

162 total number of fore cabin passengers.

E. Surveys 3.

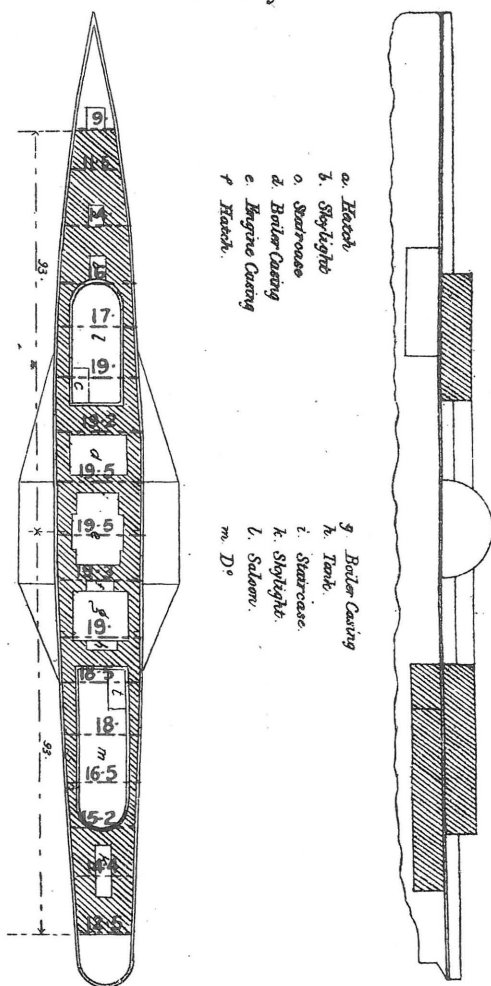


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E.—Surveys 3—*continued*.

After deck.

8)93· length from paddle shaft to steering platform.

3)11·6 interval between breadths.

3·86 = $\frac{1}{3}$ common interval.

Breadths. Multipliers. Products.

19·5	×	1	=	19·5
19·3	×	4	=	77·2
19·	×	2	=	38·
18·5	×	4	=	74·
18·	×	2	=	36·
16·5	×	4	=	66·
15·2	×	2	=	30·4
14·4	×	4	=	57·6
12·5	×	1	=	12·5

Deductions.		
Part of e.	{ 4·5 × 15·	= 64·5
	{ 2·7 × 11·6	= 31·32
f.	2· × 5·	= 10·
g.	11·7 × 13·7	= 160·29
h.	2· × 7·1	= 14·2
m.	29·4 × 12·6	= 370·44
k.	9·3 × 3·2	= 29·76
		<u>680·51</u>

411·2

3·8 = $\frac{1}{3}$ common interval.

32896

12336

1562·56 gross area of after deck.

680·51

9)882·05

Number of passengers at 9 square feet each 98·

After Saloon.

Length ..	28·8	×	breadth 11·4	=	328·32
Deduction i ..	8·9	×	7·	=	62·3

9)266·

Number of passengers at 9 square feet 29

127

After Cabin.

2)42·4 length.

3)21·2 interval between breadths.

7· = $\frac{1}{3}$ common interval.

Breadths. Multipliers. Products.

17·	×	1	=	17·
13·4	×	4	=	53·6
6·8	×	1	=	6·8

77·4

7· = $\frac{1}{3}$ common interval.

9)541·8

Number of passengers 60

Number of passengers on after deck .. 127

Do do in after cabin .. 60

Total No. of after cabin passengers .. 187Total number carried = 162 + 187 = 349

F.—Surveys 3.

Available area on deck divided between 1st and 2nd class passengers.

Deck from windlass to fore end of boiler casing.

 $4)65\cdot2$ length. $3)16\cdot3$ interval between breadths. $5\cdot4 = \frac{1}{3}$ common interval.

Breadths. Multipliers. Products.

7.1	×	1	=	7.1
11.3	×	4	=	45.2
14.1	×	2	=	28.2
14.5	×	4	=	58.
14.5	×	1	=	14.5

Deductions.

a.	$15\ 1 \times 2\ 6 = 39\ 26$
b.	$6\ 2 \times 3\ 2 = 19\ 84$
c.	$6\ 0 \times 9\ 5 = 57\ 0$
d.	$2\ 4 \times 3\ 2 = 7\ 68$
	<u>123.78</u>

 $5\ 4 = \frac{1}{3}$ common interval.612765826.2128.789)702.478.gross area of fore deck
deductions.

Number of passengers at 9 square feet each

Deck from fore end of boiler casing to steering platform.

 $4)65\cdot2$ length. $3)16\cdot3$ interval between breadths. $5\cdot4 = \frac{1}{3}$ common interval.

Breadths. Multipliers. Products.

14.5	×	1	=	14.5
14.5	×	4	=	58.
14.	×	2	=	28.
12.	×	4	=	48.
9.2	×	1	=	9.2

157.75.4 = $\frac{1}{3}$ common interval.63087885851.58211.219)640.3771.gross area of aft deck.
deductions.

Number of passengers at 9 square feet each

Fore Cabin.

 $2)35\cdot6$ length. $3)17\cdot8$ interval between breadths. $5\cdot9 = \frac{1}{3}$ common interval.

Breadths. Multipliers. Products.

4.5	×	1	=	4.5
10	×	4	=	42.4
11.2	×	1	=	11.2
				<u>58.1</u>
				<u>52.9</u>
				<u>2905</u>
				<u>9)342.79</u>
				<u>38</u>

No. of passengers

After Cabin.

 $2)29\cdot4$ length. $3)14\cdot7$ interval between breadths. $4\cdot9 = \frac{1}{3}$ common interval.

Breadths. Multipliers. Products.

10.9	×	1	=	10.9
9.3	×	4	=	37.2
4.7	×	1	=	4.7
				<u>52.8</u>
				<u>4.9 = $\frac{1}{3}$ com.</u>
				<u>interval.</u>
				<u>4572</u>
				<u>2112</u>
				<u>258.72</u>
				<u>12.15</u>
				<u>9)246.57</u>
				<u>27</u>

No. of passengers

Total number of passengers allowed.

Fore deck. Fore cabin. After deck. After cabin.

78 + 38 × 71 + 27 = 214

F. Sarveys 3.

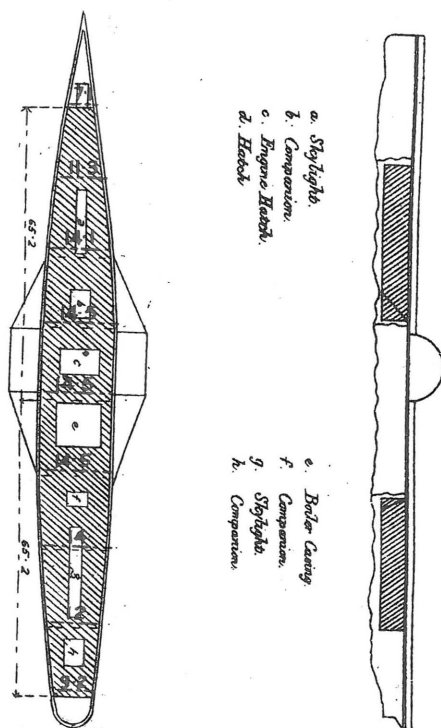


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Surveys G4, H4, I5, J5, K5, L5.

13. The measurements are to be made in the same manner as in sea-going steamers, except the after-saloons are to be included. There will be no distinction between fore-cabin and after-cabin passengers. River steamers are divided into those which ply on waters part of which only are smooth, and those which ply exclusively on smooth water.

Number of passengers for river steamers plying in partially smooth water.

Taking this division, for steamers which ply in partially smooth water, divide the number of superficial feet on deck, obtained as above, by 6, and the clear space in the after-saloon under upper deck by 9, and the sum of these quotients will be the number of passengers to be allowed.

It will usually be found that the space in front of the windlass is, more especially in sharp boats, nearly wholly taken up by the anchors and gear connected with them, and is not suitable for passenger accommodation, except in dead smooth water.

Seats, skylights, or companion openings must not be allowed for passengers, as the full area in the opening in the deck must be deducted.

The following deductions are to be made in the last-mentioned class of steamers for cattle or cargo carried in the space measured for passengers, namely :—

For every square yard of space measured for passengers, occupied by cattle or other animals, or by cargo or other articles—
One and a half passengers.

14. For harbour and river steamers, for smooth waters only, divide the number of superficial feet on deck, obtained as above, by 4, and the clear space in the after-saloon by 9, and the sum of these quotients is the number of passengers to be allowed.

Harbour and river steamers plying in smooth water only. Passengers' equipments, &c.

The following deductions are to be made in the last-mentioned class of steamers for cattle or cargo carried in the space measured for passengers, viz. :—

For every square yard of space measured for passengers, occupied by cattle or other animals, or by cargo or other articles—
Three passengers.

G.—Surveys 4. (See Pars. 13 and 14, Appendix A.)

Deck from windlass to steering platform.
8)186 length.

3)23·2 interval between breadths.

 $7·7 = \frac{1}{2}$ common interval.

Breadths.	Multipliers.	Products.
9.	× 1	= 9.
14.	× 4	= 56.
17.	× 2	= 34.
19·2	× 4	= 76·8
19·5	× 2	= 39.
19.	× 4	= 76.
18.	× 2	= 36.
15·2	× 4	= 60·8
12·5	× 1	= 12·5

Deductions.

a.	4·9	× 3·6	= 17·15
b.	4·9	× 3·2	= 15·68
c.	28·8	× 12·6	= 262·28
d.	11·5	× 13·7	= 157·55
e.	8·5	× 15.	= 127·5
	2·7	× 11·6	= 31·32
	4·6	× 10·3	= 47·38
f.	2.	× 5.	= 10.
g.	11.	× 13·7	= 160·29
h.	2.	× 7·1	= 14·2
m.	29·4	× 12·6	= 370·44
k.	9·3	× 3·2	= 29·76

400·1

 $7·7 = \frac{1}{2}$ of common interval.

23007

28007.

3080·77 gross area of deck.

1344·15

1344·15

deductions.

6)1736·62

No. of passengers 289.

Fore Saloon.
28' length
11·4 breadth

112

28

319·2

Deduction c. $7·5 \times 4·4 = 33·$

6)286.

47. No. of passengers.

After Saloon.
28·8 length.
11·4 length.

1152

288

288

328·32

Deduction i. $8·9 \times 7 = 62·3$

6)266.

44. No. of passengers.

After Cabin.
2)42·4 length

3)21·2 interval between breadths.

 $7 = \frac{1}{2}$ common interval.

Breadths.	Multipliers.	Products.
17.	× 1	= 17.
13·4	× 4	= 53·6
6·8	× 1	= 6·8

77·4

 $7 = \frac{1}{2}$ common interval.

9)541·8

No. of passengers 60.

Total number of Passengers :— $289 + 47 + 44 + 60 = 440$.

G. Surveys 4.

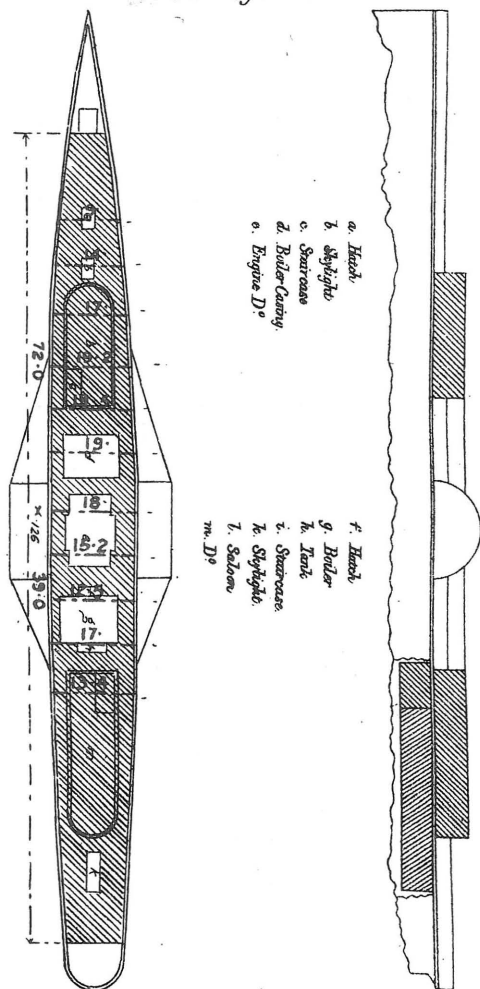


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H. Surveys 4.

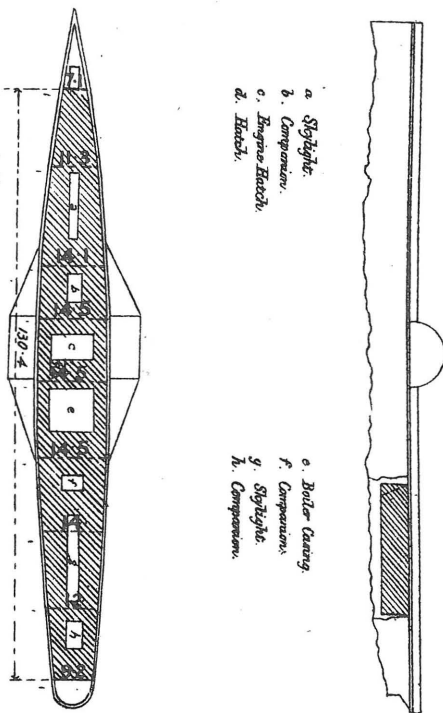


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H.—Surveys 4—*continued*.

Deck from windlass to steering platform.

8)130·4 length.

3)16·3 interval between breadths.

5·4 = $\frac{1}{3}$ common interval.

Breadths. Multipliers. Products.

7·1	×	1	=	7·1
11·3	×	4	=	45·2
14·1	×	2	=	28·2
14·5	×	4	=	58·
14·5	×	2	=	29·
14·5	×	4	=	58
14·	×	2	=	29·
12·	×	4	=	48·
9·2	×	1	=	9·2

Deductions.

a.	15·1	×	2·6	=	39·26
b.	6·2	×	3·2	=	19·84
c.	6·	×	9·5	=	57·
d.	2·4	×	3·2	=	7·68
e.	10·6	×	11·	=	116·6
f.	2·9	×	4·9	=	14·21
g.	20·1	×	2·6	=	52·26
h.	6·7	×	4·2	=	28·14

334·99

310·7

5·4 = $\frac{1}{3}$ common interval.

12428

15535

1677·78 gross area of deck.

334·99 deductions.

6)1342·79

Number of passengers on deck at 6 square feet each = 223

After Cabin.

2)29·4 length.

3)14·7 interval between breadths.

4·9 = $\frac{1}{3}$ common interval.

Breadths. Multipliers. Products.

10·9	×	1	=	10·9
9·3	×	4	=	37·2
4·7	×	1	=	4·7

52·8

4·9 = $\frac{1}{3}$ common interval.

4752

2112

Deductions

Ladder 4·5 × 2·7 =

258·72

12·15

9)246·57

Number of passengers below at 9 square feet each. 27·

Total passengers allowed :— 223 + 27 = 250.

N

I.—Surveys 5. (Appendix A.)

Deck from stem to steering platform.

8)210' length.

3) 26·2 interval between breadths.

8·7 = $\frac{1}{3}$ common interval.

	Breadths.	Multipliers.	Products.
	—	×	1
	9'	×	4
	14·7	×	2
	18·7	×	4
	19·5	×	2
	19·3	×	4
	18·4	×	2
	16·2	×	4
	12·5	×	1
			—
			370·5
			8·7 = $\frac{1}{3}$ common interval.
			25935
			29640
			—
			3223·35 gross area.
			—
			3223 35 gross area.
			1369·75 deductions.
			—
			4)1853·60
			463
			No. of passengers.
			—
			Fore Saloon.
			28' × 11·4 = 319·2 gross area.
			Deduction d. 7·5 × 4·4 = 33'
			—
			4)286·2
			71' passengers.
			—
			After Saloon.
			28·8 × 11·4 = 328·3 gross area.
			Deduction k. 8·9 × 7' = 62·3
			—
			4)266'
			66' passengers.
			—
			After Cabin.
			2)42·4 length.
			3)21·2 interval between breadths.
			7' = $\frac{1}{3}$ common interval.
			—
			Breadths.
			17'
			13·4
			6·8
			×
			1
			4
			1
			—
			17·0
			53·6
			6·8
			—
			77·4
			7' = $\frac{1}{3}$ common interval.
			—
			9)541·8
			60'
			Number of passengers below
			—
			Deck 463 passengers.
			Fore Saloon 71 "
			After 66 "
			„ cabin 60 "
			—
			Total 660

I. Surveys 5.

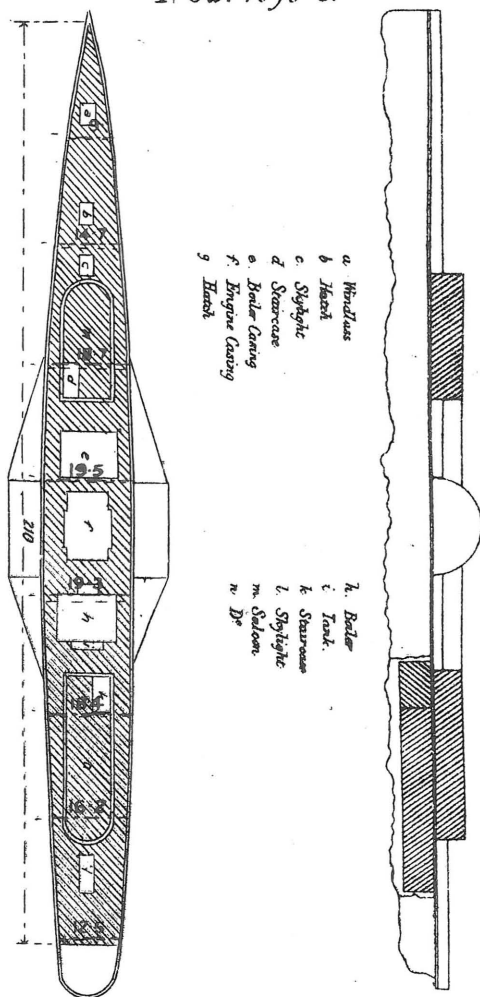


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J. Surveys 5.

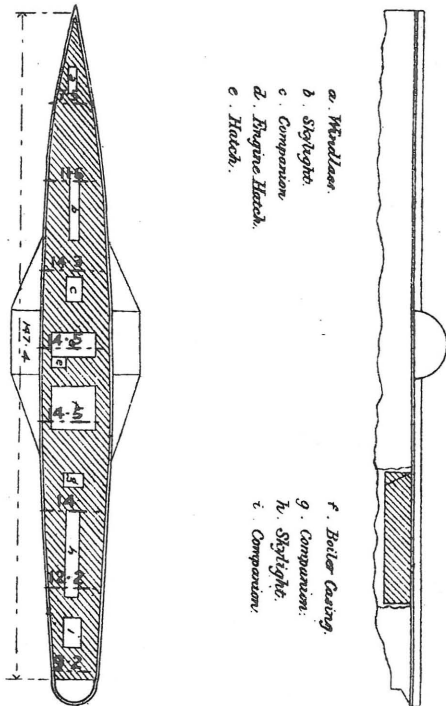


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J.—Surveys 5.

Deck from stem to steering platform.

8)147·4 length.3)18·4 interval between breadths.6·1 = $\frac{1}{3}$ common interval.

	Breadths.		Multipliers.		Products.	
	—	×	1	=	—	
	7·5	×	4	=	30·	
	11·6	×	2	=	23·2	
	14·3	×	4	=	57·2	
	14·5	×	2	=	29·	
	14·5	×	4	=	58·	
	14·	×	2	=	28·	
	12·2	×	4	=	48·8	
	9·2	×	1	=	9·2	
					<u>283·4</u>	
					6·1 = $\frac{1}{3}$ common interval.	
a.	5·4	×	2·5	=	13·5	
b.	15·1	×	2·6	=	39·26	
c.	6·2	×	3·2	=	19·84	
d.	6·	×	9·5	=	57·	
e.	2·4	×	3·2	=	7·68	
f.	10·6	×	11·	=	116·6	
g.	2·9	×	4·9	=	14·21	
h.	20·1	×	2·6	=	52·26	
	6·7	×	4·2	=	28·14	
					<u>348·49</u>	
					348·49 deductions.	
					<u>4)1380·25</u>	
					No. of passengers at 4 square feet each <u>345</u>	

After Cabin.

2)29·4 length.3)14·7 interval between breadths.4·9 = $\frac{1}{3}$ common interval.

	Breadths.		Multipliers.		Products.	
	10·9	×	1	=	10·9	
	9·3	×	4	=	37·2	
	4·7	×	1	=	4·7	
					<u>52·8</u>	
					4·9 = $\frac{1}{3}$ common interval.	
					<u>4752</u>	
					<u>2112</u>	
					<u>258·72</u>	
					<u>12·15</u>	
					<u>9)246·57</u>	
					No. of passengers below <u>27·</u>	
	No. on deck	..	..	..	345	
	No. below	..	..	..	27	
	Total	..	..	..	<u>372</u>	

K.—Surveys 5.

Deck from stem to steering platform.

8)93·8 length.

3)11·7 interval between breadths.

3·9 = $\frac{1}{3}$ common interval.

	Breadths.		Multipliers.		Products.
	—	×	1	=	—
	5·7	×	4	=	22·8
	9·8	×	2	=	19·6
	11·6	×	4	=	46·4
	12·4	×	2	=	24·8
	12·3	×	4	=	49·9
	11·6	×	2	=	23·2
	9·9	×	4	=	39·6
	9·3	×	1	=	7·3
					<u>232·9</u>
					3·9 = $\frac{1}{3}$ common interval.
a.	10·5	×	2·4	=	25·2
b.	4·6	×	3·1	=	14·26
c.	9·	×	4·4	=	39·6
d.	2·4	×	3·	=	7·2
e.	3·6	×	8·8	=	31·68
f.	4·6	×	3·1	=	14·26
g.	8·8	×	2·3	=	20·24
h.	4·	×	2·	=	8·
					<u>160·44</u>
					160·44 deductions.
					<u>4)747·87</u>
					<u>786</u>
					No. of passengers at 4 square feet each..

After Cabin.

2)24·9 length.

3)12·4 interval between breadths.

4·1 = $\frac{1}{3}$ common interval.

	Breadths.		Multipliers.		Products.
	11·2	×	1	=	11·2
	8·2	×	4	=	32·8
	4·5	×	1	=	4·5
					<u>48·5</u>
					4·1 = $\frac{1}{3}$ common interval.
					<u>485</u>
					<u>1940</u>
					<u>9)198·85</u>
					<u>22·</u>
					No. of passengers

No. on deck	186
No. below	<u>22</u>
Total No.	<u>208</u>

K. Surveys 5.

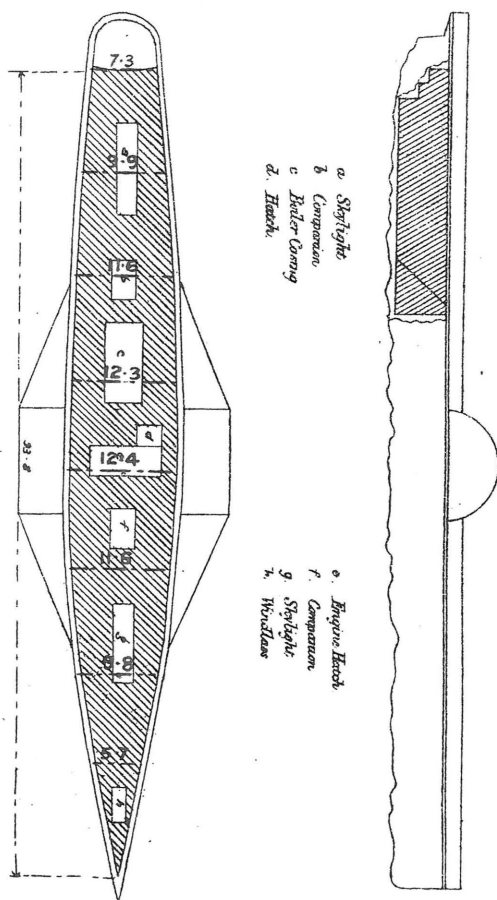


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L. Surveys 5.

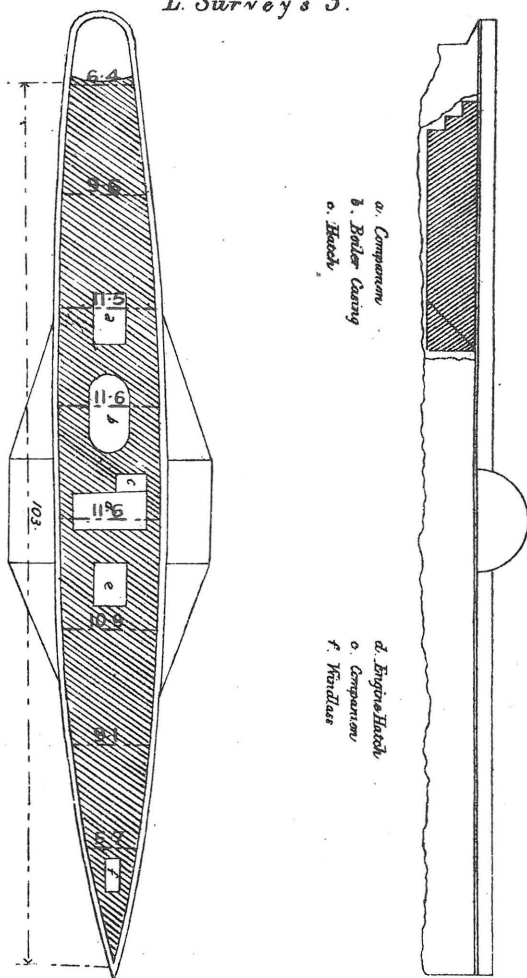


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L.—Surveys 5.

Deck from stem to steering platform.

8)103· length.

3) 12·875 interval between breadths.

4·29 = $\frac{1}{3}$ of common interval.

Breadths.		Multipliers.		Products.
	×	1	=	
5·7	×	4	=	22·8
9·1	×	2	=	18·2
10·9	×	4	=	43·6
11·6	×	2	=	23·2
11·6	×	4	=	46·2
11·5	×	2	=	23·
9·8	×	4	=	39·2
6·4	×	1	=	6·4
				<u>222·8</u>
				4·2 = $\frac{1}{3}$ common interval.
				<u>4456</u>
				<u>8912</u>
				935·76 gross area of deck.

Deductions.

a.	6·	×	4·	=	24·
b.	9·3	×	4·4	=	40·92
c.	2·4	×	3·7	=	8·82
d.	4·4	×	3·5	=	37·40
e.	6·1	×	4·	=	24·4
f.	4·	×	2·	=	8·

143·0143·64)792·16No. of passengers at 4 sq. ft. each 198

After Cabin.

2)27·2 length.

3)13·6 interval between breadths.

4·5 = $\frac{1}{3}$ common interval.

Breadths.		Multipliers.		Products.
10·9	×	1	=	10·9
8·8	×	4	=	35·2
4·5	×	1	=	4·5
				<u>50·6</u>
				4·5 = $\frac{1}{3}$ of common interval.
				<u>2580</u>
				<u>2024</u>
				<u>9)227·70</u>

No. of passengers 25·

No. on deck 198

After cabin 25

Total No. 223

APPENDIX B.

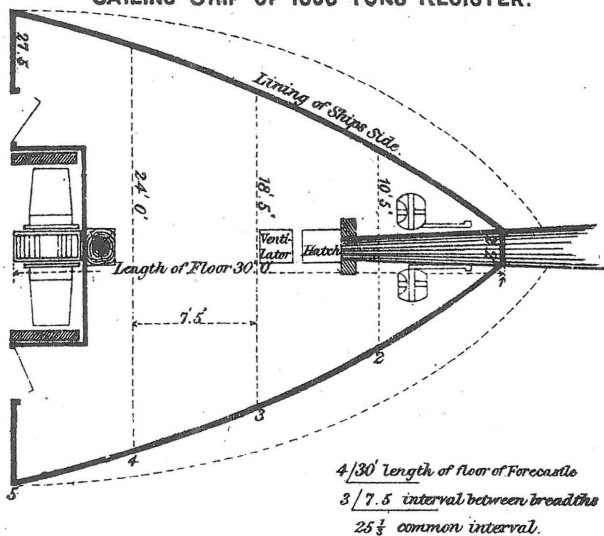
(See Par. 24, Rules and Regulations Marine Board.)

Section 9 of Merchant's Shipping Act, 1867.

THE following Rules shall be observed with respect to accommodation on board British ships (that is to say) :—

- (1.) Every place in any ship occupied by seamen or apprentices, and appropriated to their use, shall have for every such seaman or apprentice a space of not less than seventy-two cubic feet, and of not less than twelve superficial feet, measured on the deck or floor of such place :
- (2.) Every such place shall be such as to make the space aforesaid available for the proper accommodation of the men who are to occupy it, shall be securely constructed, properly lighted and ventilated, properly protected from weather and sea, and as far as practicable properly shut off and protected from effluvia which may be caused by cargo or bilge water.
- (3.) No such place as aforesaid shall be deemed to be such as to authorise a deduction from registered tonnage, under the provisions hereinafter contained, unless there is or are in the ship one or more properly constructed privy or privies for the use of the crew ; such privy or privies to be of such number and of such construction as may be approved by the survey hereinafter mentioned :
- (4.) Every such place shall, whenever the ship is registered or re-registered, be inspected by one of the Surveyors appointed by the Board, who shall, if satisfied that the same is in all respects such as is required by this Act, give to the Secretary of the Marine Board a certificate to that effect, and thereupon such space shall be deducted from the register tonnage :
- (5.) No such deduction from tonnage as aforesaid shall be authorised unless there is permanently cut in a beam, and cut in or painted on or over the doorway or hatchway of every such place, the number of men which it is constructed to accommodate, with the words "Certified to accommodate seamen."
- (6.) Every such place shall be kept free from stores or goods of any kind, not being the personal property of the crew in use during the voyage :
- (7.) Upon any complaint concerning any such place as aforesaid one of the Surveyors appointed by the Board may inspect such place, and if he finds that any of the provisions of this Act with respect to the same are not complied with he shall report the same to the Secretary of the Marine Board, at the port where the ship is registered, and thereupon the registered tonnage shall be altered, and the deduction aforesaid in respect of space disallowed, unless and until it shall be certified by such Surveyor, or some other Surveyor appointed by the Board, that the provisions of the Act in respect of such place are fully complied with :
- (8.) If any such place in any such ship is not kept free from goods and stores as aforesaid, the master shall be deemed to be in fault, and shall for every such failure to comply with the provisions of this section, forfeit and pay to each seaman lodged in such place the sum of one shilling a day for each day after complaint made to him by any two or more of such seamen during which any goods or stores, not being the personal property of the crew, are stored or kept therein :
- (9.) If in any other respect the provisions of this section are not observed with respect to any such place in any ship the owner shall be deemed to be in fault, and shall for every failure to comply with the provision of this section incur a penalty not exceeding twenty pounds.

PLAN OF A TOP-GALLANT FORECASTLE OF A SAILING SHIP OF 1000 TONS REGISTER.



Superficial Area of Floor.						Cubic Capacity of Space.
Nº of Breadths	Breadth	Multiplier	Product	Deduction for Incumbrance	Length Breadth Area.	
1	2.2	1	2.2	Bowsprit	11.5	23
2	10.5	4	42.0	Compressors.	2.0	2.8
3	18.5	2	37.0	Hatch	2.5	2.
4	24.0	4	96.0	Ventilator	2.5	2.
5	24.5	1	27.5	Windlass	11.5	3
Sum of Products 204.7					Total	73.1

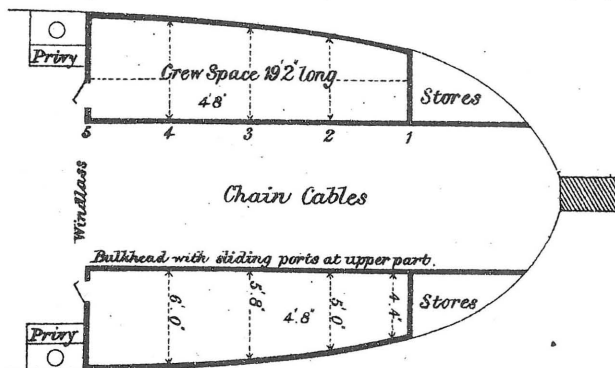
$2.5 - \frac{1}{2}$ Common Interval
 10.5 5
 408.4
 511.75 - gross area of floor
 73.1 - deductions for incumbrances
 438.65 - clear area of floor
 36 = persons at 12s feet each, and this will be the number

that the crew space will be certified to accommodate, seeing that it is the smallest of the quotients obtained by the two Calculations (see Article 3 of Practical Instructions)

(47-59-96)

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PLAN OF A TOP-GALLANT FORECASTLE OF A
SAILING BARQUE OF 500 TONS REGISTER.



$4/19'2''$ —length of floor of crew space.
 $3/4'8''$ —distance or interval between breadths.
 $1'6''$ —common interval

Superficial Area				Cubic Capacity.
Number of Breadths	Breadths	Multipliers	Products.	
1	4	4	1	4
2	5	0	4	20
3	5	8	2	11
4	6	0	4	24
5	6	0	1	6
Sum of Products				66
				1
				396
				660
				$12/105.60$ Area
				8 persons on each side
				at 12s feet each.

Therefore the number that this Forecastle will be certified to accommodate will (both by the computation of superficial area and cubic capacity) be eight on each side.

(47.53-56)

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APPENDIX D.

Cylindrical Boiler Shells.—Joints with drilled holes.

Formula for ordinary chain riveted and ordinary zigzag riveted joints, and for joints of these descriptions, when every alternate rivet in the outer or in the outer and inner rows have been omitted :—

- Let E = distance from edge of plate to centre of rivet in inches.
 „ V = distance between rows of rivets in inches.
 „ V_1 = distance between inner and middle row of rivets for joints J and K (Figs. 18 and 17).
 „ B = boiler pressure in lb. per square inch.
 „ C = 1 for lap or single butt joints.
 „ „ = 1.75 for double butt joints.
 „ d = diameter of rivets in inches.
 „ D = inside diameter of boiler in inches.
 „ F = factor of safety for shell-plates, as by par. 167.
 „ n = number of rivets in one pitch.
 „ pD = diagonal pitch in inches.
 „ Pd = diagonal pitch in inches between inner and middle rows of rivets for joint J.
 „ p = greatest pitch of rivets in inches.
 „ r = percentage of plate left between holes in greatest pitch.
 „ R = percentage of rivet section.
 „ R_1 = percentage of combined plate and rivet section.
 „ S = tensile strength of material in lb. per square inch of section.
 „ T = thickness of plate in inches.
 „ T_1 = thickness of each butt strap in inches.
 „ $\%$ = least value of r , R , R_1 , as the case may be, divided by 100.

When joints are used in boiler construction, other than those shown in the attached sketches, or when any of the rivets are pitched less than two diameters apart, the particulars of such joints should be submitted for the consideration of the Board.

Ordinary Chain and Zigzag Riveted Joints.

Figs. 1 to 12.

Iron plates and iron rivets, or steel plates and steel rivets :—

$$\frac{100 (p - d)}{p} = r$$

Iron plates and iron rivets :—

$$\frac{100 \times d^2 \times .7854 \times n \times C}{p \times T} = R$$

Steel plates and steel rivets :—

$$\frac{100 \times 23 \times d^2 \times .7854 \times n \times C \times F}{5 \times 28 \times p \times T} = R$$

Given C, d, F, n, T, to find p, so that r and R are equal.

Iron plates and iron rivets :—

$$\frac{d^2 \times .7854 \times n \times C}{T} + d = p$$

Steel plates and steel rivets :—

$$\frac{23 \times d^2 \times .7854 \times n \times C \times F}{5 \times 28 \times T} + d = p$$

Given C, F, n, T, r, to find p and d.

Iron plates and iron rivets :—

$$\frac{r \times T}{(100-r) \times .7854 \times n \times C} = d$$

$$\frac{(100 \times r) \times T}{(100-r)^2 \times .7854 \times n \times C} = p$$

Steel plates and steel rivets :—

$$\frac{5 \times 28 \times r \times T}{23 \times (100-r)^2 \times .7854 \times n \times C \times F} = d$$

$$\frac{100 \times 5 \times 28 \times r \times T}{23 \times (100-r)^2 \times .7854 \times n \times C \times F} = p$$

Iron plates and iron rivets, or steel plates and steel rivets, when d is found first, then :—

$$\frac{100 d}{100-r} = p$$

Butt Straps.

Iron plates and iron butt straps, or steel plates and steel butt straps. Double butt straps :—

$$\frac{5 \times T}{8} = T_1$$

Single butt straps :—

$$\frac{9 \times T}{8} = T_1$$

For distance between rows of rivets, &c. :—

Iron and steel—

$$\frac{3 \times d}{2} = E$$

Chain riveted joints. Figs. 2, 4, 6, 9, 11, not less than :—

$$\frac{4d + 1}{2} = V, \text{ but in no case is } V \text{ or } V \text{ to be less than twice the diameter of the rivet.}$$

Zigzag riveted joints. Figs. 3, 5, 7, 10, 12 :—

$$\frac{\sqrt{(11p + 4d)(p + 4d)}}{10} = V$$

Diagonal pitch. Figs. 3, 5, 7, 10, 12 :—

$$\frac{6p + 4d}{10} = pD$$

or say ; the horizontal direct pitch $\times .65$
+ diameter of rivet $\times .35 = pD$

To determine the working pressure :—

$$\frac{S \times \% \times 2T}{F \times D} = B$$

Chain and zigzag riveted joints in which every alternate rivet has been omitted in the outer row, or in the outer and inner rows, such as are shown by the following sketches :—

Figs 13 to 20.

Iron plates and iron rivets, or steel plates and steel rivets :—

$$\frac{100(p - d)}{p} = r$$

Iron plates and iron rivets :—

$$\frac{100 \times d^2 \times .7854 \times n \times C}{p \times T} = R$$

Steel plates and steel rivets :

$$\frac{100 \times 23 \times d^2 \times .7854 \times n \times C \times F}{5 \times 28 \times p \times T} = R$$

Iron plates and iron rivets, or steel plates and steel rivets :—

$$\frac{100 (p - 2d)}{p} + \frac{R}{n} = R_1$$

For iron lap joints of this description the diameter of the rivet should not be less than—

$$\frac{T}{.7854} = d$$

For steel lap joints of this description the diameter of the rivet should not be less than—

$$\frac{T \times 28 \times 5}{.7854 \times 23 \times F} = d$$

Butt Straps.

Where the number of rivets in the inner row is double the number in the outer row.

Iron plates and iron butt straps, or steel plates and steel butt-straps.

Double butt-straps :—

$$\frac{5 \times T (p - d)}{8 \times (p - 2d)} = T_1$$

Single butt-straps :—

$$\frac{9 \times T (p - d)}{8 \times (p - 2d)} = T_1$$

When the number of rivets in the inner row is the same as in the outer row.

Double straps :—

$$\frac{5 \times T}{8} = T_1$$

Single butt-straps :—

$$\frac{9 \times T}{8} = T_1$$

For distance between rows of rivets, &c.

Iron and steel :—

$$\frac{3 \times d}{2} = E.$$

Chain riveted joints, Figs. 13, 15, 17, 19 :—

$$\sqrt{\frac{(11p + 4d)(p + 4d)}{10}} = V; \text{ or}$$

$\frac{4d + 1}{2} = V$ is preferable, but in no case is V or V_1 to be less than twice the diameter of the rivet.

Zigzag riveted joints, Figs. 14, 16, 18, 20 :—

$$\sqrt{(\frac{1}{2}p + d)(\frac{1}{2}p + d)} = V$$

Diagonal pitch, Figs. 14, 16, 18, 20 :—

$$\frac{3}{10}p + d = p_d$$

For joint J, Fig. 18 :—

$$\sqrt{\frac{(11p + 8d)(p + 8d)}{20}} = V_1$$

Diagonal pitch, Fig. 18 :—

$$\frac{3p + 4d}{10} = p \text{ for inner row,}$$

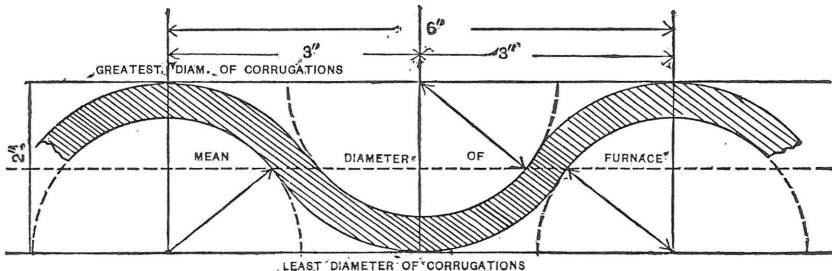
$$\frac{3}{10}p + d = p_d \text{ for outer row.}$$

Rivet Holes.—The distance from the rivet hole to the edge of the plate is usually equal to the diameter of the hole; in the case of drilled holes it may be a little less.

Zigzag joints, diagonal pitch.—In zigzag riveting, the amount of metal—measured diagonally between the edges of rivet holes—should be from 27 per cent. to 30 per cent. greater than *half* the metal between two holes in the longitudinal pitch, otherwise the plate will be weakest through the diagonal pitching. The *minimum* pitch for diagonal rivets should not be less than $\cdot 65$ pitch + $\cdot 35$ diameter of rivet.

FOX'S CORRUGATED BOILER FURNACES.

Half-size Section of Corrugation.



*Construction of New Boilers, &c.**

To be filled in for the information of the Engineer Surveyors, and attached to tracing.

Tracing must be on cloth.

Owner's name—

Ship's name—

Maker's name, and where constructed—

If of Steel—maker's name and brand—

If of Iron—maker's name and brand—

Working pressure required—

Inside diameter, length, and thickness of shell—

Number of plates in shell—

Thickness of front and back end plates in steam space—

Thickness of back mid plates—

Thickness of back lower plates—

Thickness of front tube plates—

Thickness of front lower plates—

Thickness of back tube plates—

Thickness of combustion chamber plates—top, bottom, sides and back—

Furnaces—outside diameter, length and thickness—

Furnaces—corrugated or plain (iron or steel)—

Furnaces—lapped or butted and strapped—

Furnaces—single or double strapped—

Furnaces—single or double riveted—

Furnaces—breadth and thickness of butt straps—

Furnaces—diameter and pitch of longitudinal riveting.

Furnaces—diameter and pitch of end (circumferential) riveting—

Class of longitudinal joints in shell, lapped or strapped—

Breadth and thickness of butt straps in shell, steel or iron—if lapped, breadth of lap—

Pitch and diameter of rivets in longitudinal joints—steel or iron rivets—

Percentage of strength (longitudinal) through plates—

Percentage of strength (longitudinal) through rivets—

Class of ring seam joints—

If lapped—breadth of lap, diameter and pitch of rivets—

Single—double or treble riveted—

Rivets—steel or iron—

Percentage of strength (ring seams) through plates—

Percentage of strength (ring seams) through rivets—

Holes—punched or drilled—

Holes—punched before or after bending—

Holes drilled—in or out of place—before or after bending—

Factor of safety claimed—

Diameter and pitch of water space stays at bottom of thread, steel or iron—fitted with nuts or bats—

Number of threads to the inch in water space stays—

Diameter and pitch of steam space stays at bottom of thread—steel or iron—

*. Forms can be obtained on application to the Engineer Surveyor.

- If fitted with nuts inside and out, riveted washers or double plates—
 Number of threads to the inch—
 Number, outside diameter, and thickness of ordinary tubes in each boiler, steel or iron—
 Number, outside diameter, and thickness of stay tubes in each boiler, steel or iron—
 Sectional area of stay tubes at bottom of thread in squares inches—
 Length, depth, and sectional thickness of combustion chamber girders—
 Combustion chamber girders, steel or iron—
 Distance of girders from centre to centre—
 Diameter, number, and pitch of stay bolts in each girder, steel or iron—
 Section area of each bolt at bottom of thread—
 Number of threads to the inch—
 Circumferential riveting of shell and end plates; diameter and pitch of rivets, single, double, or triple—steel or iron—
 End plates, how riveted across, single or double; diameter and pitch of rivets—
 Combustion chamber riveting—diameter and pitch of rivets—
 Superheater or steam chest—outside diameter and thickness of shell—steel or iron—
 Thickness of ends or top—
 Pitch and diameter of longitudinal riveting—
 Pitch and diameter of ring seam and end riveting—
 Pitch and diameter of flange riveting to shell—
 Pitch and diameter of top to shell riveting—
 Diameter and thickness of connecting pipes between shell and steam chest—
 Steel or iron—
 Diameter and pitch of rivets—
 Size of manhole—usual dimensions 12" x 16"—should not be less than 11" x 13"; longest diameter athwart the boiler's length (for very high pressure all manholes should be made with truly faced joints finished in machine or lathe)—
 Area of manhole punched out in square inches—
 Breadth and thickness of strengthening ring must equal area punched out, exclusive of rivet holes—
 Diameter and pitch of rivets in strengthening ring—single or double riveted—
 Grate bar in square feet—
 Heating surface in tubes, in square feet—
 Total sectional area through tubes in square feet—
 Sectional area of funnel in square feet—
 Diameter and number of safety-valves on each boiler—
 Tracing of safety-valve (on cloth) with all necessary particulars to be submitted for approval—
 A portion of shell and furnace riveting—longitudinal and ring seams—must be shown on tracing, to a scale of not less than 3" to the foot.
 All dimensions to be marked in plain figures. The nature of the material, thickness of all plating—steel or iron—must be distinctly marked on tracing. In case of any novelty in design, the makers to supply all necessary information and details before the work is commenced.

Tests for Steel Boilers.

Steel Plates.—All imported plates should be branded, having the tensile strength and elongation stamped on each plate, in a place where it can be seen after the boiler is constructed.

Steel Rivets.—A few of each size, selected and turned for tensile stress, which should range from 26 to 30 tons per square inch. Elongation in 10", not less than 25 per cent. Contraction of area about 60 per cent.

Bending Test.—The cold bending strips should not be less than 10" long and 2" broad; they should be bent until the sides are parallel at a distance from each other of not more than three times the thickness of the plate without fracture.

Radius (inner) of bend is three times the plate's thickness.

Plates not exposed to Flame.—The strips are to be tested in their normal condition (cold); but strips cut from furnaces, combustion chambers, &c., should be heated cherry red, then plunged into water at about 80° Fahr., and kept there until of the same temperature as the water, and then bent.

Tensional Strength of Steel Plates should range from 28 to 32 tons per square inch when not exposed to flame. 28 tons (equal to 62,750 lb.) is to be used in the calculations for cylindrical shells; but in cases where the strength of the steel exceeds 28 tons, and allowance is expected for the excess, the case is to be submitted to the principal officer for consideration.

Test Strips for Testing Machine should not be more than 1 inch in sectional area, carefully prepared in planing or shaping machine; distance between centres of strip 10", and length overall 18" (this allows 3" at each end for the "grip" of machine, and 1" at each end for a well-rounded fillet).

Tensile Strength of Plates worked in Fire.—All flanged plates, and those in furnaces, combustion chambers, &c., should range from 26 to 30 tons per square inch.

Annealing.—All plates that are flanged, punched, or locally heated, must be carefully annealed. The plates should be heated all over—at one operation—in a properly constructed furnace, and then allowed to cool gradually.

Punching and Drilling.—All rivet holes should be drilled; but if it is intended to punch them small, and afterwards bore and anneal them in a proper furnace, the Surveyors should be supplied with all particulars. All punched holes should be made *after* bending; the same applies to plates punched and afterwards bored. Steel plates in tension should never be welded; if in compression, they must be carefully annealed. Steel plates should never be punched; experience has proved that with suitable appliances they can be drilled cheaper, besides being much more reliable. Steel should never be worked when hot—below a perceptible red heat. All shell plates, and those intended for steam domes, &c., should be bent cold.

Bars for Steel Stays will be tested in a similar manner and under the same conditions as steel plate strips.

Ample Notice—two or three days—should be sent to the Surveyors, when any tests are to take place.

Tests for Iron Boilers.

Tensile strength of B.B. Boiler Plates.—Lengthways (with the grain), 21 tons per square inch. Crossways (across the grain), 18 tons per square inch.

Bending Tests, Hot.—B.B. boiler plates should, when hot, bend to an angle of 125° lengthways, and 100° crossways, without fracture; radius of bend, equal to three times the plate's thickness.

Bending Tests, Cold.—B.B. boiler plates should bend cold to the following angles, according to their thickness:—

Thickness of plates.		Lengthways.		Crossways.	
1" and $\frac{1}{8}$ "	...	15°	...	5°	
$\frac{7}{8}$ " and $\frac{3}{4}$ "	...	20°	...	$7\frac{1}{2}$ °	
$\frac{3}{4}$ "	...	22 $\frac{1}{2}$ °	...	10°	
$\frac{11}{16}$ "	...	25°	...	10°	
$\frac{5}{8}$ "	...	27 $\frac{1}{2}$ °	...	12 $\frac{1}{2}$ °	
$\frac{9}{16}$ "	...	30°	...	12 $\frac{1}{2}$ °	
$\frac{1}{2}$ "	...	35°	...	15°	
$\frac{7}{16}$ "	...	42°	...	17 $\frac{1}{2}$ °	
$\frac{3}{8}$ "	...	50°	...	20°	
$\frac{1}{4}$ "	...	60°	...	25°	
$\frac{1}{8}$ "	...	70°	...	30°	

Bar, Angle, and Tee Iron.—Tensile strength, 22 tons, lengthways.

Bar Iron, Hot.—Bars should stand punching and bending without fracture; the punch not less than one-third the bar's diameter; the holes not more than one and a half times the bar's diameter from the end. Holes should bear drifting out to the bar's diameter without fracture.

Flat Bars.—All flat bars $\frac{3}{4}$ " thick and under should, when *hot*, bend to a radius of not more than two and a-half times their thickness.

Bar Iron, Cold.—Should bend as per table; and samples are notched on one side, then bent, and must show a fibrous fracture.

Angle Iron, Hot.—The angles are bent transversely to a radius of three times their thickness; they should bear flattening out without fracture.

Angle Iron, Cold.—Samples are notched on one side to prove the fibrous quality of the iron, and flanges are cut off and bent cold, as per bar iron.

Tee Iron, Hot and Cold.—Flanges and stem are bent in a similar manner to the angle iron; cold test the same.

Copper Steam Pipes, Feed Pipes, &c.—The Surveyors wish to point out the importance, and in fact the imperative necessity of paying strict attention to the construction of copper steam and feed pipes, especially those intended for exceptionally high pressures.

The material is to be carefully selected and must be of the very best quality.

Test-strips will be cut from the sheet and also from the pipes *after they are brazed*. They will be tested in a similar manner to the steel strips.

The tensile strength of the strips cut from the sheet should not be less than 30,000 lb. per square inch.

Elongation not less than 25 per cent.

Contraction of area not less than 35 per cent.

Short sharp bends are to be avoided as much as possible. All bends to be carefully annealed by being heated dull red and gradually allowed to cool.

All flanges to be of proportional thickness.

All flanges truly faced in lathe.

No holes to be drilled in flanges until after brazing. All flanges to have three V circles cut in each to ensure tight jointing, and for very high pressures, 150 lb. and upwards, the flanges should be spigoted in main steam and feed pipes.

Ample provision to be made for expansion, &c., by the introduction (where required) of expansion joints, fitted with proper stuffing-boxes and glands.

All steam pipes subjected to the boiler pressure must be tested with cold water to at least double the working pressure, and this must be done in the presence and to the satisfaction of the Surveyors.

It is also very desirable that after being fitted in the vessel, the whole range of main steam pipes—high pressed cylinder, joints, stop-valves, &c.—should be tested to double the working pressure (cold water test).

The working pressure of copper steam pipes will be calculated by the following rule:—

$$\text{Working pressure} = \frac{3,000 \times \text{twice the thickness}}{\text{inside diameter}}.$$

Stop-valves, safety-valve chests, &c., should be cast from specially prepared metal—at least thrice melted—and must be of uniform section, proportional thickness, and properly ribbed.

Boiler mountings should also be made of specially prepared metal, and every cock and valve must be ribbed—truly faced and flanged to boiler, all having spigots carefully fitted.

All the surfaces must be truly faced before the joints are made.

Long handles should also be fitted to gauge glass cocks, to enable steam and water to be shut off, in case the gauge glass breaks.

WM. CRUICKSHANK.

March, 1889.

Engineer Surveyor.

New South Wales, Sydney, }
to wit.

UNDER and by virtue of the powers conferred upon us by the Navigation Acts of 1871—1881, we the Marine Board of New South Wales, hereby make the following Regulation relating to steam pipes of passenger steamers, that is to say:—

We hereby order and direct that all new copper steam pipes shall, when practicable, be tested by hydraulic pressure to not less than twice and not more than two and one-half times the working pressure, unless the case has been specially submitted to the Board for consideration.

Wrought-iron lap-welded steam-pipes shall be tested by hydraulic pressure, when new, to at least twice the working pressure, but not to more than three times, unless the case has been specially submitted to the Board for consideration.

As regards old pipes, the Surveyor may, at any time he thinks it necessary before he gives a declaration, have them tested by hydraulic pressure to satisfy himself as to any doubtful part, but they may be tested, with the lagging removed for examination at least once in about every four years, to not less than double the working pressure.

There must be sufficient means provided for draining the steam-pipes.

Where practicable, all main steam-pipes are to be taken down and thoroughly annealed every four years, and when under test the jointing arranged so that the whole of the flange brazing will be exposed to the full pressure.

When steam-pipes are tested, the amount of test, the date, and the initials of the Surveyor are to be legibly stamped on every flange. Thus—

Tested—320 lb.

15/3/95.

W.D.C.

The working pressure of well-made copper pipes when the joints are brazed is found by the following formula:—

$$\frac{6,000 \times (T - \frac{1}{16})}{D} = \text{working pressure.}$$

Where T = thickness in inches.

„ D = inside diameter in inches.

When the pipes are solid drawn and not over 8 inches in diameter, substitute in the above formula $\frac{1}{32}$ for $\frac{1}{16}$.

The internal pressure on wrought iron pipes made of good material, which are lap-welded and a sound job, may be determined by the following formula, provided that the thickness is not less than $\frac{1}{4}$ inch :—

$$\frac{6,000 \times T}{D} = \text{working pressure.}$$

Where T = thickness in inches.

„ D = inside diameter in inches.

Feed pipes must be made efficient for a pressure at least 20 per cent. in excess of the boiler pressure.

The common seal of the Marine Board of New South Wales was affixed this 23rd day of November, one thousand eight hundred and ninety-six.

FRANCIS HIXSON, President.

JOHN BROOMFIELD, Vice-President.

ARCHIBALD M'LEAN,

ROBT. T. MOODIE,

BENJAMIN JENKINS,

JOHN WILDRIDGE,

TIMOTHY O'SULLIVAN,

} Wardens.

GEO. S. LINDEMAN, R.N., Secretary.

[Diagrams.]

Ordinary Chain & Zig Zag riveted Joints

Single riveted Lap Joint

Fig. 1

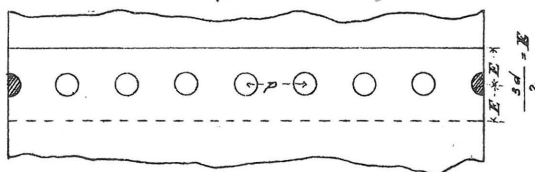


Fig. 2

Double riveted Lap Joints

Chain riveting

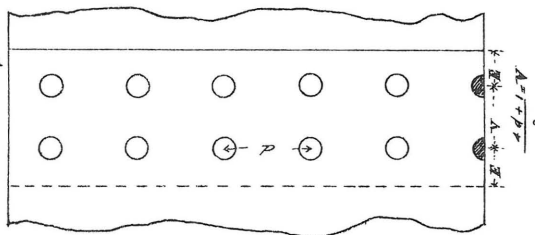
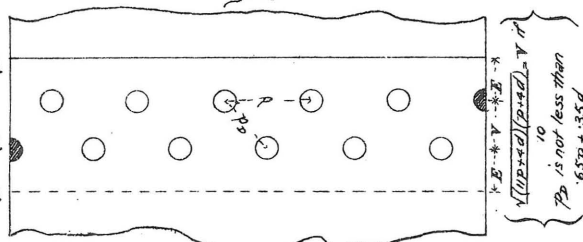


Fig. 3

Double riveted Lap Joints

Zig Zag riveting



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APPENDIX D.
Ordinary Chain and Zig Zag Joints.
Continued.

Fig 4.

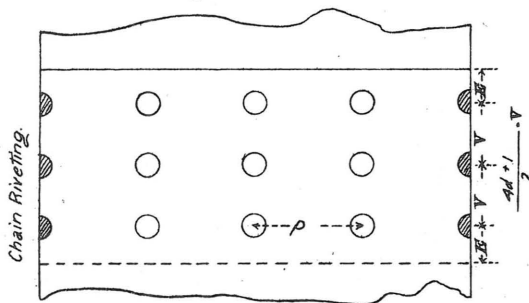
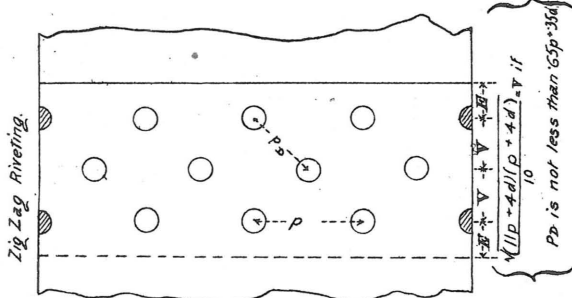


Fig 5.

Treble riveted lap joints.

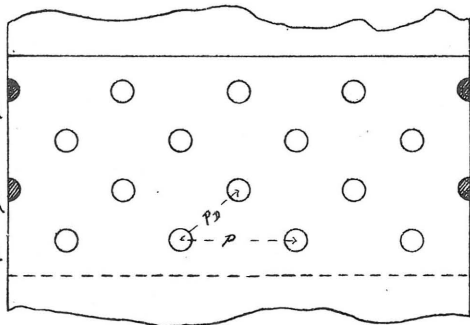
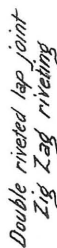


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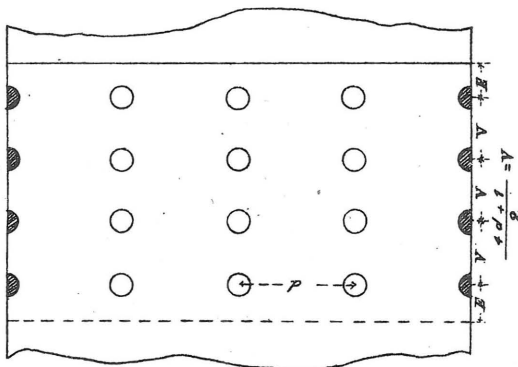
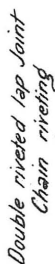
Fig. 7



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$\sqrt{\frac{11p+4p}{10}} = \sqrt{\frac{15p}{10}}$ less than .65p + .35p

Fig. 6.



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APPENDIX D
Ordinary Chain and Zig Zag Joints
continued.

Fig 8.

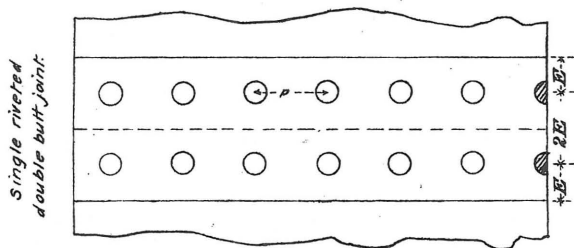
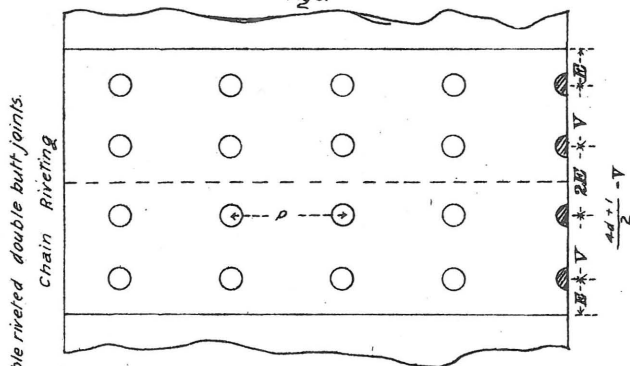


Fig 9.



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APPENDIX D
Ordinary Chain and Zig Zag Joints.

Continued.

Fig 10

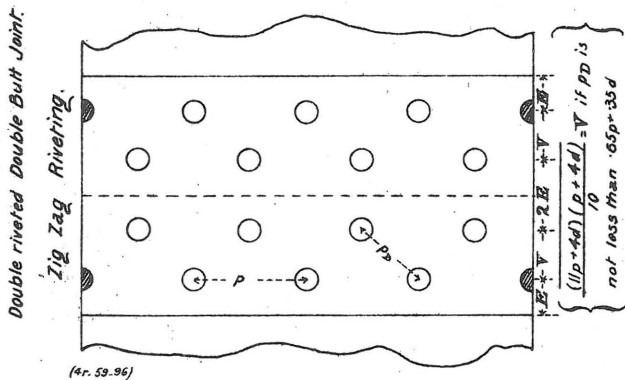
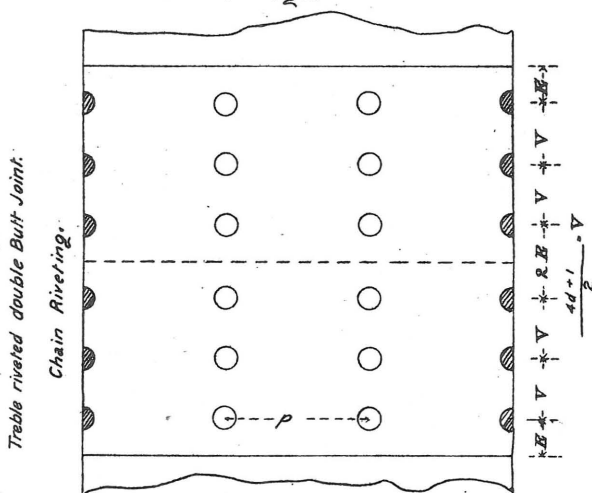


Fig 11.



APPENDIX D.

continued

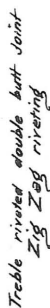


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APPENDIX D.

Chain and Zig Zag riveted joints in which every alternate rivet is omitted in the outer row, or in the outer or inner rows.

Fig 13.

Treble riveted lap joint
each alternate rivet omitted in the outer row.

Chain riveting.

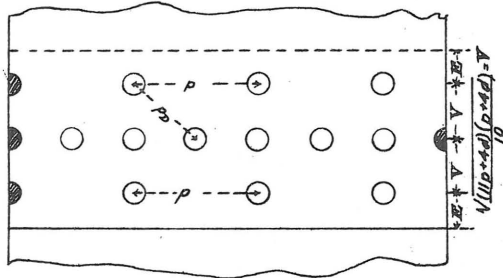


Fig 14.

Zig Zag Riveting

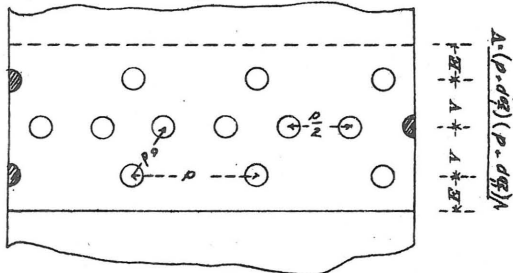


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Fig 15.

APPENDIX D.

Treble riveted double Butt Joints.

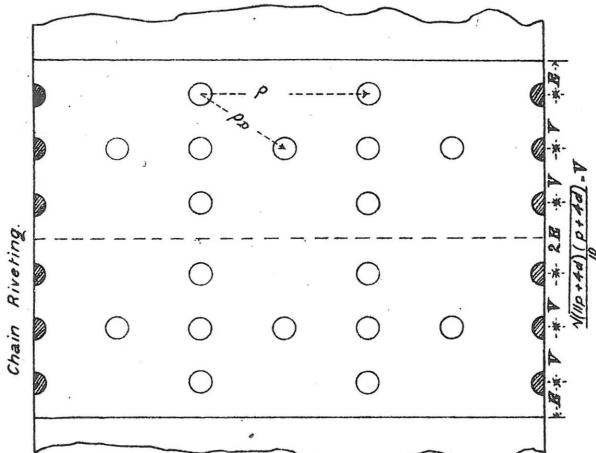
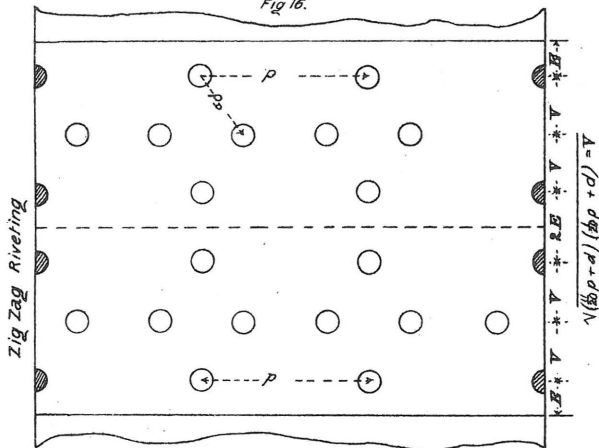


Fig 16.

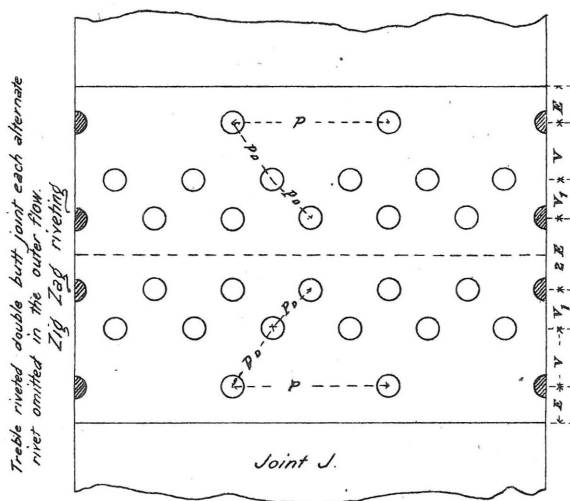


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Fig. 18.

APPENDIX D



$$V \left(\frac{11}{10} p + d \right) \left(\frac{16}{10} p + d \right) = V$$

$$\frac{V (11p + 8d) (p + 8d)}{20} = V_1$$

$$\frac{3p + 4d}{10} = p_0$$

$$\frac{3}{10} p + d = p_D$$

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Fig 19

APPENDIX D

Double riveted double butt joint.
each alternate rivet omitted in the outer row.

Chain Riveting.

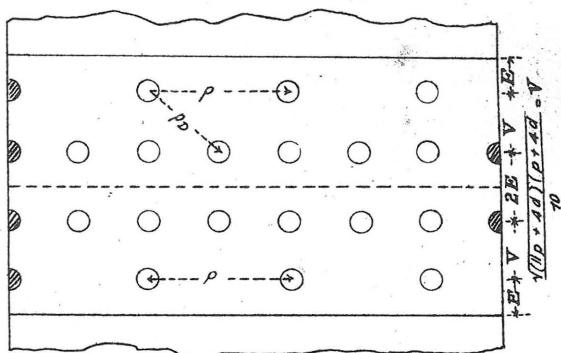


Fig 20

Zig Zag Riveting.

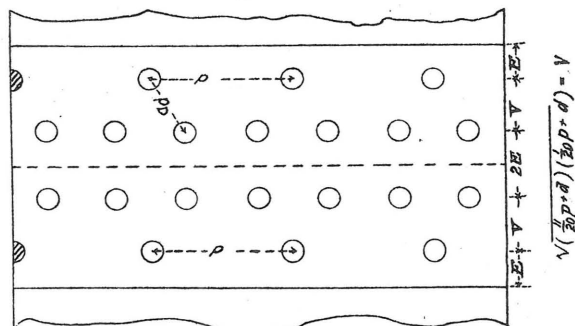


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20
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